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ABSTRACT

This annual volume is a compilation of articles addressing evaluation, management, professional affairs, practice parameters, and clinical application of speech and language services. Featured articles include: (1) "Comparison of Pressure, Flow, and Resistance for Modal and Loft Register Productions" (Joseph L. Langhans and Peter J. Watson); (2) "Self-Report of Benefit from Adaptive Processing Circuitry among Experienced and Inexperienced Hearing Aid Users" (Harvey B. Abrams and others); (3) "Second Language Acquisition in Adolescent Hispanic Students for School Speech-Language Pathologists" (Alejandro Brice); (4) "Gross Examination of the Vestibular System: A Tutorial" (Frederick E. Cobb); (5) "Treatment of Dysphagia Resulting from Cricopharyngeal Dysfunction with Botox: Preliminary Thoughts and Observations" (Steven P. Kostas and others); (6) "CASPER: Computer Assisted Speech Evaluation and Rehabilitation System" (James A. Till); (7) "Practice Parameters: What Are They and How Will They Affect Health Care Practice?" (Paul Watson Lambert); (8) "Voice Therapy for Patients with Parkinson's Disease" (Dee Adams Nikjeh); and (9) "A Survey of Educational Programs in Speech-Language Pathology: Counseling, Dysphagia, and Traumatic Brain Injury" (Pamela A. Gilmore and others). (Articles contain references.) (CR)

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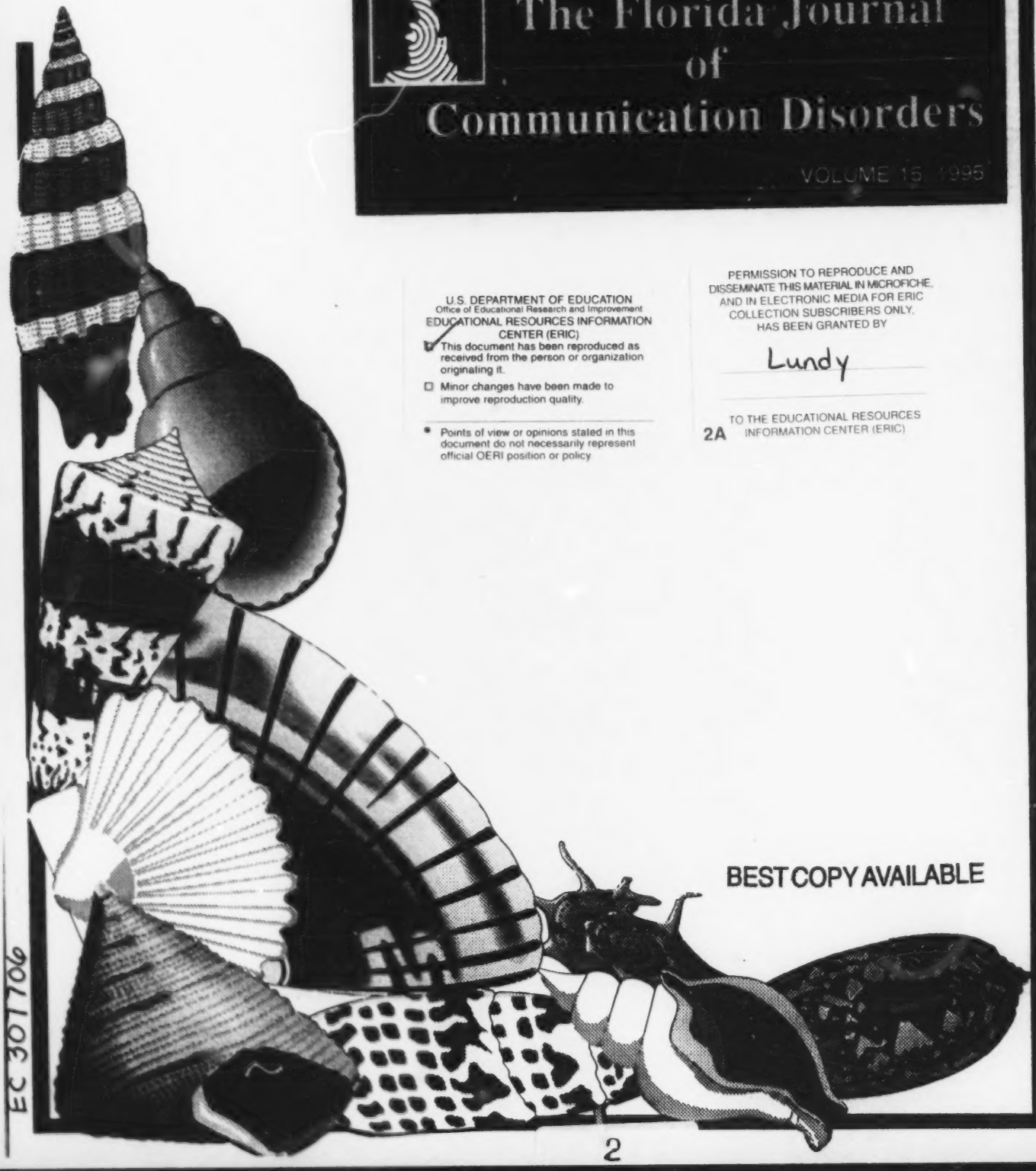

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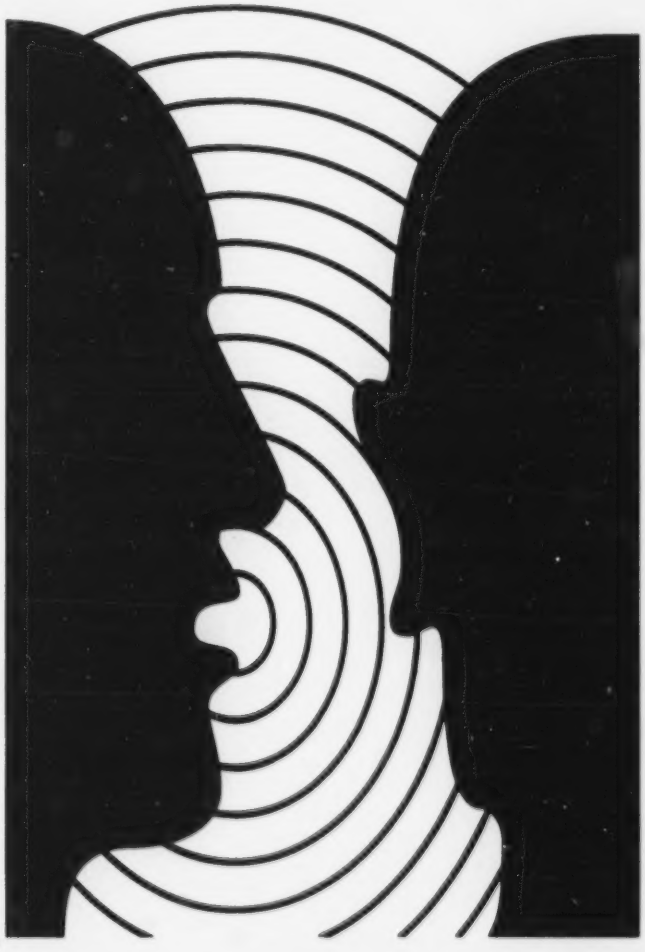
FOREWORD

The annual Journal publication of the Florida Association of Speech-Language Pathologists and Audiologists by Executive Board approval, and with the consent of the membership, has a new name. Beginning with Volume 15, the Journal will be titled The Florida Journal of Communication Disorders. Volume 15 is a compilation of articles addressing evaluation, management, professional affairs, practice parameters and clinical application. The contents are contemporary, relevant, thought-provoking and, overall, interesting.

Contributions to The Florida Journal of Communication Disorders may take the form of clinical and research articles, case studies, review articles, tutorials, clinical reports/methods/programs/technology, and papers addressing professional issues. Submitted manuscripts are peer reviewed by members of the Editorial Review Board. A complete copy of the "Publication Policies" of the Florida Association of Speech-Language Pathologists and Audiologists may be obtained from the Association Office. Authors are invited to respond to the "Call for Papers" for Volume 16 of the Journal. The "call" will be published in the FLASHA FORUM.

Joseph J. Langhans
Editor



Comparsion of Pressure, Flow, and Resistance for Modal and Loft Register Productions

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ABSTRACT

A noninvasive clinical method for estimating laryngeal airway resistance (R_{tm}) during vowel production (Smitheran & Hixon, 1981) was used to compare pressure, flow and resistance for five frequencies produced in both the modal and loft registers. Resistance and pressure were significantly higher for modal than loft register productions. A trend for resistance and pressure to increase with an increase in frequency was observed for both registers.

INTRODUCTION

Vocal registers have been investigated perceptually, acoustically, and aeromechanically (Hollien, 1974; Large, 1972). Aeromechanically, the parameters pressure and flow are measured and resistance is calculated as the quotient of pressure divided by flow. In research investigating aeromechanical parameters of speech, an esophageal balloon (Kunze, 1964; Isshiki & von Leden, 1964; Ladefoged, 1962; Van den Berg, 1956), subglottic catheter (Van den Berg, 1956), or tracheal puncture procedure (Kunze, 1964; Isshiki & von Leden, 1964; Perkins & Yanagihara, 1968; Sant, Fisher, & Logemann, 1970; Shipp & McGlone, 1971; Van den Berg, 1956) have been used to sense and measure tracheal pressure. These procedures have tended to be invasive. Flow has generally been measured using a recording spirometer (Horii & Cooke, 1975; Isshiki, Okamura, & Morimoto, 1967) or a pneumotachometer coupled either to a face mask or to the mouth of a subject (Hirano, Koike, & von Leden, 1968; Isshiki, 1964, 1965; Isshiki & von Leden, 1964; Yanigahara & Koike, 1967).

A noninvasive clinical method for estimating the resistance imposed by the laryngeal airway to the flow of air through it during vowel production was developed and field tested by Smitheran and Hixon (1981). This clinical method was less invasive than previous methods which used the tracheal puncture procedure, an esophageal balloon or a subglottic catheter for pressure measurement. Numerous studies have used the method of Smitheran and Hixon (1981) to measure both pressure and flow, and to calculate laryngeal airway resistance (R_{tm}). The method has been used to measure pressure and flow, and to calculate R_{tm} during singing (Hixon, Langhans, & Smitheran, 1981), during utterance in women (Langhans, 1981), as a function of time in women (Leeper & Graves, 1984), for productions by both children and adults (Netsell, Lotz, & Barlow, 1989), as a function of age in men (Melcon, Hoit, & Hixon, 1989), as a function of age in women (Hoit & Hixon, 1992), and as a function of vocal sound pressure level and syllable context (Wilson & Leeper, 1994). The use of this clinical method with voice disordered persons was reported by Netsell, Lotz, and Shaughnessy (1984). Netsell, Lotz, Peters, and Schulte (1994) compared and described developmental patterns in pressure, flow, and resistance in children and adults. Reviews of the use of this method with female subjects (Langhans, 1989) and its application to voice disordered persons (Langhans, 1993) have been reported as well.

The purpose of this work was to compare the parameters pressure, flow and resistance for modal and loft register productions using the noninvasive clinical method of Smitheran & Hixon (1981). The aeromechanical parameters pressure and flow were measured, and resistance calculated for modal and loft register productions of /pi/ for five frequencies which fell within the range of frequency overlap for a sample of adult male subjects.

METHODOLOGY

Subjects - Six adult male subjects ranging in age from 22 to 35 years participated. Three subjects were "trained" singers who had completed or were in the process of completing a Master of Music degree in Vocal Performance. Three subjects were "untrained" (casual) singers who sang in a choir or were enrolled in a voice class for adults in continuing education. As the average register overlap for nonsingers is three semitones and for singers approximately nine semitones (Colton & Hollien, 1972), a minimum requirement for participation in this study was that each subject be at least a "casual" singer and presumably capable of producing more than three and as many as nine overlapping semitones. As well, it was necessary that each subject be able to pitch-match the same frequencies in both the modal and loft registers. Five frequencies which fell within the range of frequency overlap for all six subjects were investigated. They were 233 Hz ($A^{\sharp}_{3}$), 247 Hz (B_{3}), 262 Hz (C_{4}), 277 Hz ($C^{\sharp}_{4}$), and 294 Hz (D_{4}). All frequencies were rounded to the nearest whole. All subjects passed a hearing screening, were non-smokers, and reported no history of voice disorder, neurological disease or active upper respiratory ailment.

Procedure - The conceptual foundation and utterance design for the clinical method used is detailed in the seminal work of Smitheran and Hixon (1981). Discussion of this information is abbreviated here. The method of Smitheran and Hixon applies general fluid dynamics theory to the air-filled respiratory passageways. With certain combinations of

valving adjustments involving the larynx, velopharynx and oral segment, one can estimate pressure-flow events from measurements made at locations different from the measurement locations of interest. This enables estimation of trans-laryngeal pressure and translaryngeal flow from oral pressure and airway-opening flow, respectively. Using these pressure and flow values, resistance is then calculated as the quotient of the ratio between oral pressure (P_o) and airway-opening flow ($\dot{V}_{ao}$). Subjects produce the syllable /pi/ in three trains of seven syllables each at a rate of 1.5 syllables per second or 90 beats per minute as paced by a metronome. Justification for design of this utterance and selection of rate are described further in Smitheran and Hixon (1981) and Langhans (1989, 1993).

In this study, pressure was measured using a small polyethylene oral pressure sensing tube that was inserted through a hard rubber anesthesia mask. The tube was positioned orally at midline approximately one cm. posterior to the central incisors. Airway opening flow was measured using a Silverman type pneumotachometer coupled to the mask. Both the pressure and flow output signals were transmitted individually to differential air-pressure transducers (H-P 270 Differential Pressure Transducers), then to carrier amplifiers where each signal was amplified and low pass filtered. The pressure analog was displayed on one channel and the flow analog on a second channel of a dual channel thermal recorder

(H-P 321 Dual Channel Carrier Amplifier-Recorder). Using a function generator (Krohn-Hite Model 5100A Generator), a triangular wave was generated, amplified and outputted via ear phone to each subject. The frequency of this triangular wave was read from a digital counter (Data Precision 5740 Digital Counter) which also received the amplified signal. Each subject was asked to take in a breath twice quiet breathing depth and then to "pitch-match" the frequency outputted from the earphone using the syllable/pi. A "pitch-match" was determined using the function generator-digital counter arrangement and the Visi-Pitch (Kay Elemetrics, Model 6087). The microphone to the Visi-Pitch was hand held over the right thyroid lamina of each subject by one examiner for each frequency in each register. A match was realized if the digital counter receiving the output from the function generator and the Visi-Pitch digital display of the laryngeal signal from the microphone were the same. This was determined from a prolonged production of the vowel portion of the CV syllable /pi/ during an initial trial production of the utterance (Figure 1).

Vocal intensity was monitored relatively using the Visi-Pitch. For each subject a "comfortable" intensity "standard" was established by having the subject produce /pi/ in three trains of seven syllables each before the mask was positioned to the face, prior to the experimental production task. This was done for each frequency produced in each register. Also, the microphone to a sound level meter (General Radio 1933 Precision Sound Level Meter and Analyzer) was positioned 12 inches and at a 90 degree angle of incidence from the lips of each subject. This comfortable "intensity" was recorded from the sound level meter in dB SPL. The amplitude of the tracing on the screen of the Visi-Pitch was marked for comparison when in-the-mask and performing the experimental production task relative to when out-of-the-mask. Each subject was required to match this standard during the experimental production task.

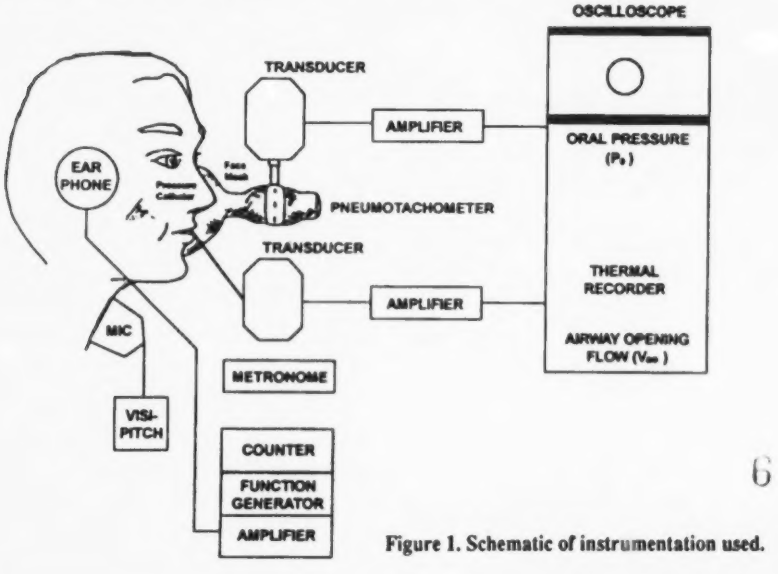

Figure 1. Schematic of instrumentation used.

The determination of vocal register used by the subject - modal or loft - was made perceptually (Hollien, 1974) and had to be agreed upon by both the examiner and the subject. Rate of utterance was guided by a metronome set at 90 beats per minute (1.5 beats per second). Order was randomized for frequency and the register in which each frequecy was produced first, for example, modal then loft or loft then modal.

DATA ANALYSIS

Data were obtained from pressure and flow tracings (Figure 2). The inferred translaryngeal pressure value in centimeters of water was culled from the peak-to-peak midpoint at the interconnection of the third and fourth, fourth and fifth, and fifth and sixth oral pressure peaks, respectively. The flow value in liters per second was culled from the point of intersection of a vertical line drawn from the peak-to-peak bisection between the pressure peaks to the immediately underlying flow trace. These pressure and flow values were inserted into the R_{low} formula:

$$R_{low}(cmH_2O/LPS) = P_o(cmH_2O)/\dot{V}_o(LPS).$$

Mean R_{low} was calculated for each syllable train, then the grand mean for three trains was calculated for each subject. Mean pressure and flow were also calculated for each syllable train and the grand mean calculated for each subject. In an attempt to preclude end effects, initial and final pressure and flow tracings were discarded for the purpose of calculating pressure, flow, and resistance values for each subject.

Pressure, flow, and resistance data were analyzed using the Sign Test, a nonparametric statistical procedure useful for difference testing with small samples. The statistical procedure was applied to within group data as a function of register for each of the three variables: resistance, pressure, and flow. A pre-determined criterion level of $p < .05$ was used for all analyses.

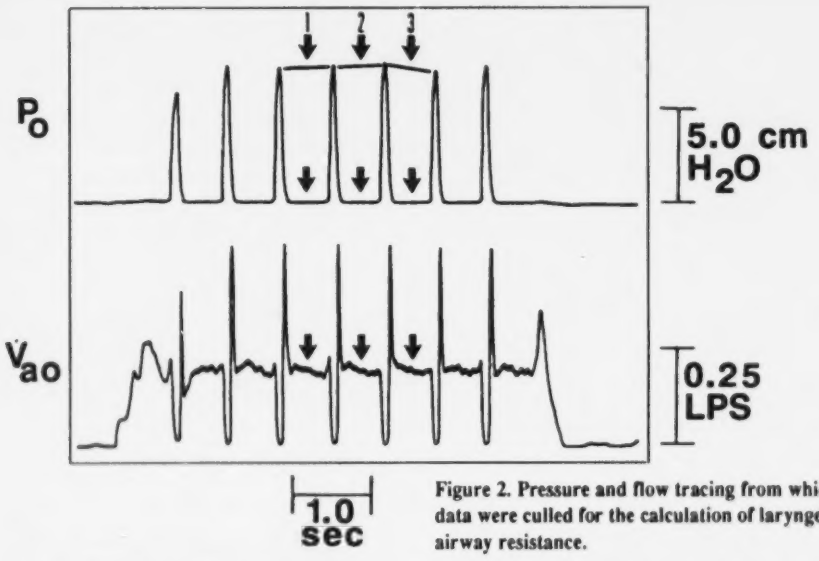

Figure 2. Pressure and flow tracing from which data were culled for the calculation of laryngeal airway resistance.

Resistance - R_{low} values in the modal register were greater than R_{low} values in the loft register. The difference was significant statistically (Table 1). This observation conformed with Kunze (1962) who also compared modal and loft register productions. The data set of Kunze (1962) indicated that on average, modal register productions were greater than loft register productions. In his study, as with many previously conducted studies preceding Smitheran and Hixon (1981), pressure values used to calculate resistance were obtained using a more invasive tracheal puncture procedure. A general trend in which R_{low} increased with increasing frequency both in the modal and loft registers was further observed in our data set. A similar general trend was observed in Kunze's data, as well.

Table 1. Comparison of R_{low} values (cm H_2O/LPS) by frequency in the modal and loft registers using the Sign Test.

Frequency (in Hertz)	Modal Register	Loft Register
233	32.4	22.9
247	34.2	24.7
262	39.1	26.8
277	37.2	28.4
294	44.3	31.3

p-value = .0312

Pressure - Pressures were greater in the modal register than in the loft register at the level of significance (Table 2). This, too, was consistent with Kunze (1962) who observed that for the same frequency, pressure was greater in the modal than in the loft register. In addition, a trend was observed in which pressure increased as frequency increased in both registers. This finding is consistent with other data for modal register productions reported by Kunze (1962), Ladefoged (1962), Shipp and McGlone (1971), and van den Berg (1956).

Table 2. Comparison of pressure values (cm H_2O) by frequency in the modal and loft registers using the Sign Test.

Frequency (in Hertz)	Modal Register	Loft Register
233	10.3	7.5
247	11.3	7.5
262	11.4	8.2
277	12.0	8.7
294	12.6	8.9

p-value = .0312

Flow - Differences in flow between registers were not discernible statistically. Flow in the modal register was neither greater nor less than flow in the loft register (Table 3). Kunze (1962) reported a similar finding. Further inspection of flow data, failed to indicate a trend for either an increase or decrease in flow with an increase or decrease in frequency for modal register productions. Kunze (1962), Perkins and Yanagihara (1968), Shipp and McGlone (1971), and van den Berg (1956) reported similar results. In our data set, there was a general trend for flow to decrease with increasing frequency in the loft register. Again, Kunze (1962) reported a similar observation.

Table 3. Comparison of flow values (cc/sec) by frequency in the modal and loft registers using the Sign Test.

Frequency (in Hertz)	Modal Register	Loft Register
233	338.3	340.9
247	357.0	343.7
262	320.2	324.8
277	363.7	317.8
294	366.8	302.0

p-value = .5000

SUMMARY

A noninvasive clinical method for estimating laryngeal airway resistance was used to compare aeromechanical parameters: resistance, pressure and flow. These parameters were compared for five overlapping frequencies produced in both the modal and loft registers. Six adult males served as subjects. Three subjects were trained and three were untrained singers. Resistance was found to be greater in the modal register compared to the loft register and increased with increasing frequency in both registers. Pressure was also greater in the modal register than in the loft register. As with resistance, there was a trend for pressure to increase as frequency increased in both registers. No systematic relationship was observed for flow with an increase or decrease in frequency in the modal register. A general trend for flow to decrease with increasing frequency in the loft register was observed. The results observed in this study for resistance, pressure, and flow across registers conformed with results observed and reported in the literature by other authors who used more invasive procedures.

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Self-Report of Benefit from Adaptive Processing Circuitry Among Experienced and Inexperienced Hearing Aid Users

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ABSTRACT

A self-report questionnaire was used to assess the benefits of adaptive processing circuitry among experienced and inexperienced hearing aid users. To determine benefit, the responses of adaptive processing circuitry users were compared to the responses of linear circuitry users. The results indicated that adaptive processing was beneficial, but only in terms of perceived quality of speech in noise among experienced hearing aid users. In addition, both experienced and inexperienced hearing aid users reported satisfaction with their new hearing aids regardless of the circuitry, suggesting that a careful clinical approach to fitting the instruments may be more critical to patient satisfaction than the type of circuit selected.

INTRODUCTION

Adaptive processing is one of the terms used to describe strategies to improve the amplified signal-to-noise ratio for hearing aid use. The results of studies which measure effectiveness of adaptive processing circuits in improving speech intelligibility in noise have been equivocal. Fabry and Van Tassell (1990) examined the intelligibility of connected discourse in noise using a master hearing aid with a filter that automatically increased the cutoff frequency as background noise increased. The authors failed to observe a significant difference in speech recognition for either of two conditions: adaptive filter switched on and adaptive filter switched off. Klein (1989) measured and compared speech intelligibility performance between a Zeta Noise Blocker™ (ZNB) and a conventional hearing aid. The ZNB incorporates a circuit which automatically adjusts the frequency response of the hearing instrument in response to the frequency characteristics of competing background noise. Similar speech intelligibility performance was obtained with both instruments. Van Tassell, Larsen, and Fabry (1988) demonstrated some improvement with adaptive processing circuitry which was limited to high frequency speech intelligibility in the presence of low frequency noise. Gordon-Salant and Sherlock (1992) demonstrated limited improvement among elderly hearing-impaired subjects but only among high-predictability sentences of the Revised-Speech Perception in Noise test (Bilger, Neutzel, Rabinowitz & Rzeczkowski, 1984).

In contrast, Stein and Dempesy-Hart (1984) and Stein, McGee and Lewis (1989) demonstrated significant improvement in speech intelligibility in noise with the ZNB and other adaptive processing instruments when compared with non-adaptive signal processing instruments.

It has been suggested that measures of speech intelligibility may not be the most appropriate index of effectiveness (Fabry, 1991). For example, adaptive processing circuits may influence factors such as the "ease" of listening in a noisy environment and, as a result, be preferred to linear instruments as measured by satisfaction or preference ratings. However, when Bentler (1993) compared the satisfaction ratings among four instruments with adaptive processing noise suppression and one without, no differences were found. Interestingly, the subjects expressed a high level of satisfaction with the instruments selected for them, suggesting that a careful clinical approach to fitting hearing instruments may be more critical to patient satisfaction than the type of circuit selected.

Satisfaction, and self-report of benefit from the use of an adaptive processing hearing aid employing an automatically adjustable filter was examined by Preves and Sigelman (1989) using a seven item questionnaire designed by them. Their results indicated varying levels of satisfaction under differing listening environments. In discussing their results, Preves and Sigelman hypothesized that differences in hearing aid experience may pose a problem with using a questionnaire due to differing frames of reference. That is, it is reasonable to expect that experienced hearing aid users, particularly those who have worn linear instruments, would be more sensitive to the improvements that adaptive processing circuits are purported to provide than inexperienced hearing aid users. In addition, inexperienced hearing aid users might have unrealistically high expectations for hearing aid performance. Using only experienced hearing aid users as subjects, Surr, Cord, and Walden (1993), found no measurable difference in the number of subjects who chose an adaptive processing circuit (K-Amp™) over a linear circuit (Class D amplifier), after successive 30 day trials. Further and systematic study of the role of experience with hearing aid use on the self-report of benefit or satisfaction with adaptive processing is needed. The present study was a preliminary investigation into the influence of experience with amplification on the self-report of benefit and satisfaction from the use of adaptive processing.

METHODS

Subjects

Thirty-five adults, all outpatients in the Audiology and Speech Pathology Service at the VA Medical Center, Bay Pines, Florida served as subjects. All subjects were diagnosed with sensorineural hearing loss and had been fit binaurally with in-the-ear hearing aids within the previous two years. Eighteen subjects were fit with linear instruments: 10 were experienced hearing aid users and 8 were inexperienced. Seventeen subjects were fit with adaptive processing instruments: 10 were experienced hearing aid users and 7

were inexperienced. No attempt was made to match the subjects by age or hearing loss.

Materials

The adaptive processing instruments used for this study incorporated a signal processing scheme which utilized decreasing low frequency gain as input level to the hearing aid increased. The questionnaire previously used by Preves and Sigelman (1989) was modified for this study making it applicable to users of either linear or adaptive processing instruments (Appendix A). All references to automatic noise attenuation features and manufacturers' names were eliminated. The questionnaire contained simplified forms of intelligibility, sound quality, and quasi-paired comparison rating tasks as well as a rating of the subject's overall satisfaction with the hearing instrument under different listening situations.

Procedure

Hearing aids were selected by certified and licensed, audiologists utilizing each manufacturer's Matrix scheme. The Matrix selected was the one which best predicted the NAL-R target (Byrne & Dillion, 1986) for real ear insertion response (REIR) based on each subject's audiogram. The REIRs were verified with one of three real ear instrumentation systems (Fonix 5500-Z, Fonix 6400, or Rastronics CCI/10) utilizing either a composite signal or sweep frequency warble tone stimulus at a 50 dB input level. The stimulus speaker was placed at an approximate 45 degree angle relative to the subject's nose and at a distance of approximately 18 inches from, and level with, the test ear. The probe tube was placed at an approximate distance of within 6 mm of the tympanic membrane. The reference microphone was placed just below the pinna.

Following leveling of the test environment in accordance with the manufacturer's instructions, the REIR was adjusted through acoustic and or electrocoustic means until the REIR approximated the NAL-R target. At the time the study was undertaken, no acceptance criteria were established for "closeness of fit" and it was left to the discretion of the clinician as to whether or not the instruments should be accepted or sent back to the manufacturer for modification.

Following the fitting, the subjects were instructed on the use and care of their instruments as well as expected benefits and limitations of amplification. They were also required to demonstrate proper insertion, operation, and removal of their hearing aids prior to discharge from the clinic.

Approximately three weeks following the hearing aid fitting, subjects returned to the clinic for a group follow-up session. Physical and electroacoustic modifications were made, as appropriate, to resolve post-fitting problems such as discomfort, feedback, or unsatisfactory sound quality. The session was also used to allow group members to share their problems and successes. The clinician advised participants on strategies to maximize communication through improved listening skills, environment management, assertiveness, and assistive devices. Subjects experiencing major problems requiring recasing or a change in model or circuitry were scheduled for return visits.

QUESTIONNAIRE

The questionnaire and a self-addressed stamped return envelope were mailed to 40 patients whose hearing aid history matched the characteristics previously described for the four groups. To maintain anonymity, each questionnaire contained a code which only identified whether the questionnaire was completed by a subject who was an experienced or inexperienced hearing aid user and whether the hearing aids incorporated linear or adaptive processing circuitry. The initial questionnaire return rate was 66%. An additional 20 questionnaires were then mailed. The returned questionnaires from the two mailings resulted in the group sizes described earlier.

RESULTS

The percentage of experienced and inexperienced subjects using adaptive processing or linear hearing aids providing each response to each question were calculated and are shown in Figures 1-6. A descriptive analysis of the response pattern for each question was conducted to measure any differences between adaptive processing and linear hearing aids for the experienced and inexperienced hearing aid users.

Figure 1 shows the results for the first question, which asked how bothersome background noise was with the new hearing aids. Histograms representing "more" bothersome are a combination of "very" and "somewhat bothersome" subject responses. Subject responses for "slightly" and "not bothersome" were combined and are depicted in the "less" bothersome histograms. In examining the results for the experienced hearing aid users, perhaps the most important difference to note is the percentage of subjects reporting that background noise was "not bothersome." While none of the adaptive pro-

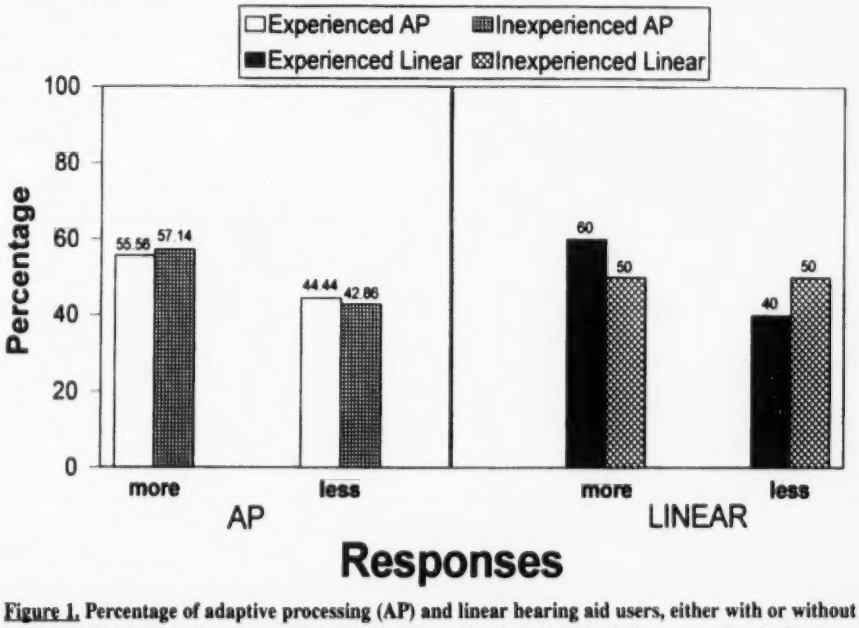

Figure 1. Percentage of adaptive processing (AP) and linear hearing aid users, either with or without prior hearing aid experience, reporting that background noise was essentially more or less bothersome in response to Question 1 on the questionnaire.

cessing subjects chose the "not bothersome" response, 30% of the linear subjects found background noise not to be bothersome with their new hearing aids. The responses from the remaining adaptive processing subjects were fairly evenly split between the "somewhat-" and "slightly bothersome" responses. Among the linear subjects, most of the remaining reported that background noise was "somewhat bothersome." An equal percentage of subjects in both groups (10%) reported that background noise was "very bothersome" with their new hearing aids and one subject in the adaptive processing group did not provide a response to this question.

This pattern of results suggests that about half of the subjects in each group were relatively "more" bothered by background noise and about half were relatively "less" bothered.

Since the goal of adaptive processing is to reduce the negative effects of background noise, it was surprising that among the half that were relatively "less" bothered by background noise, none of the adaptive processing subjects chose " not bothersome," while 30% of the linear subjects chose this response. Thus, in terms of how bothersome background noise was reported to be among experienced hearing aid users, no advantages were seen for adaptive processing.

Similarly, no advantages were seen for adaptive processing circuitry among the inexperienced hearing aid users. When the responses which indicated being relatively "less" bothered by background noise were examined, it was seen that, as with the experienced hearing aid users, none of the adaptive processing subjects reported being "not" bothered by background noise, while 13% of the linear subjects chose this response. Furthermore, while 43% of the adaptive processing subjects reported that background noise was "very bothersome" with their new hearing aids, none of the linear subjects chose this response. Again, these observations were surprising, and certainly not supportive for the use of adaptive processing as a method for reducing the negative effects of background noise.

The ease of listening to speech in noise was rated in Question #2. The results are illustrated in Figure 2. Histograms representing "difficult" are a combination of "very" and "somewhat difficult" subject responses. Subject responses for "easy" and "very easy" are combined and are depicted in the "easy" histograms. As with the previous question, little support for the use of adaptive processing for reducing the negative effects of background noise was observed for the experienced hearing aid users. That is, while 70% of the adaptive processing subjects rated the ease of listening to speech in background noise with their new hearing aids as "somewhat" difficult, this response was chosen by only 40% of the linear subjects. Furthermore, while another 40% of the linear subjects chose the response indicating that listening to speech in background noise was "easy," only 10% of the adaptive processing subjects chose this response.

Similarly, the response pattern for the inexperienced hearing aid users also suggests little advantage for adaptive processing. That is, the majority of the linear subjects (63%) reported that listening to speech in background noise was "easy" while the majority of adaptive processing subjects (57%) reported that it was "somewhat difficult." Thus, there did not appear to be any advantage associated with the use of adaptive processing in terms of reported ease of listening to speech in noise for either experienced or inexperienced hearing aid users.

Question 3 addressed the issue of understanding speech in noise, both in quiet (Figure 3a) and in noise (Figure 3b). In terms of understanding speech in quiet, little difference is seen in the response patterns for the adaptive processing and linear circuitry subjects who were experienced hearing aid users. The majority in both groups reported that they understood speech in quiet "fairly well." Although the majority of inexperienced

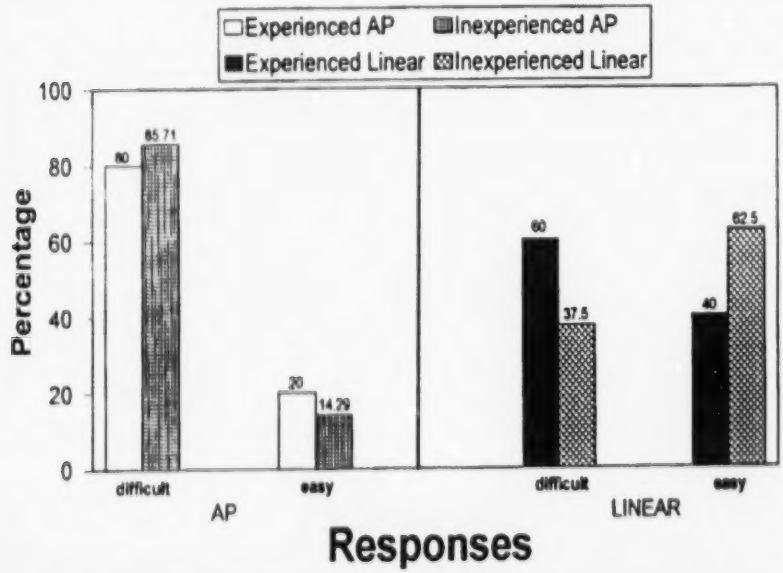

Figure 2. Percentage of adaptive processing (AP) and linear hearing aid users, either with or without prior hearing aid experience, reporting that listening to speech in noise was easy or difficult in response to Question 2 on the questionnaire.

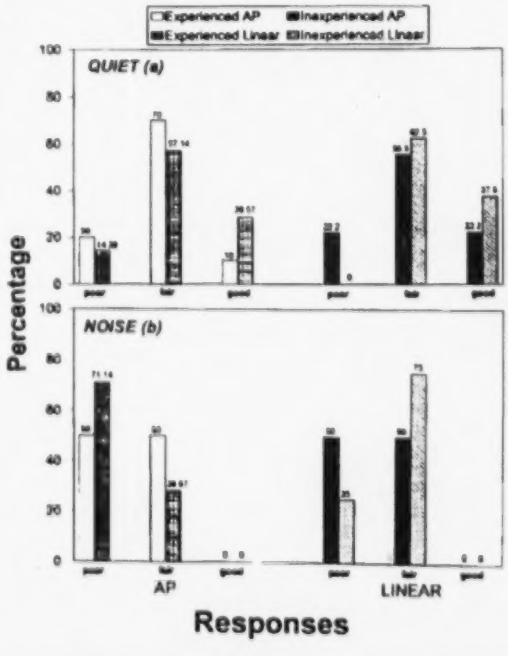

Figure 3. Percentage of adaptive processing (AP) and linear hearing aid users, either with or without prior hearing aid experience reporting that understanding speech in quiet (a) and in noise (b) was poor, fair or good in response to Questions 3a and 3b on the questionnaire.

hearing aid users in both the adaptive processing and linear groups also chose the response "fairly well," it is interesting to note that, unlike all other groups, none of the inexperienced hearing aid users with linear circuitry reported "poorly" understanding speech in quiet. The observation that the majority of subjects in all groups reported that they understood speech in quiet "fairly well" with their new hearing aids was not surprising as hearing aids, both adaptive processing and linear, should help in quiet. If adaptive processing is more beneficial than linear circuitry, differences should be observed in background noise. The observation that none of the inexperienced hearing aid users in the linear group reported poor understanding of speech in noise was, however, somewhat surprising and suggests the possibility that these subjects may have had inherently different speech perception capacities than did the subjects in the other groups. This possibility arose again in examining the responses to other questions.

As is seen in Figure 3b, among the experienced hearing aid users no advantage for adaptive processing over linear circuitry in terms of understanding speech in noise was observed. That is, 50% of the subjects in both groups chose the response "poorly," indicating poor understanding of speech in noise and 50% chose the response "fairly well" for understanding speech in noise. The responses of the inexperienced hearing aid users were even more discouraging for the use of adaptive processing. That is, while only 25% of the linear subjects reported poor understanding of speech in noise with their new hearing aids, 71% of the adaptive processing subjects chose this response. While this observation was discouraging, it should be remembered that the responses regarding understanding speech in quiet for the inexperienced hearing aid users suggested that the linear subjects may have had inherently different speech perception capacities. If this is the case then that may account for why such a relatively small percentage of subjects in the linear group reported poor understanding of speech in noise with their new hearing aids.

Figures 4a and 4b show responses to Question 4 regarding the quality of speech in quiet and in background noise, respectively. Histograms representing "poorer" are a combination of "very" and "somewhat poor" subject responses.

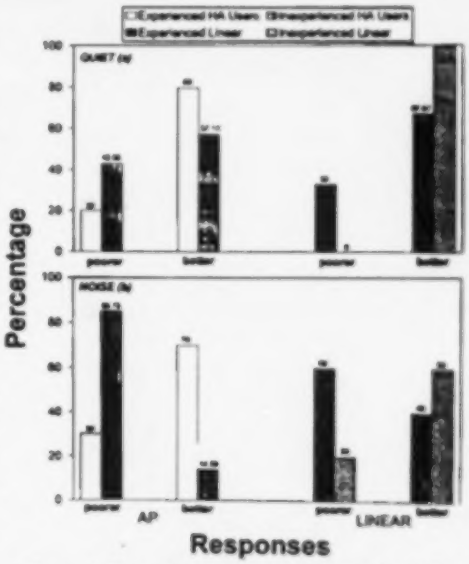

Figure 4. Percentage of adaptive processing (AP) and linear hearing aid users, either with or without prior hearing aid experience, reporting that the quality of speech in quiet (a) and in noise (b) was poorer or better in response to Questions 4a and 4b on the questionnaire.

Subject responses for "fairly good" and "excellent" are combined and are depicted in the "better" histograms. Among the experienced hearing aid users, there appeared to be a slight advantage for quality of speech in quiet for adaptive processing subjects. That is, although 56% of the linear subjects reported that the quality of speech in quiet with their new hearing aids was "fairly good" and 11% reported it to be "excellent," these percentages together (67%) were considerably less than the percentage of adaptive processing users (80%) who reported that the quality of speech in quiet with their new hearing aids was "fairly good". Similarly, while only 20% of the adaptive processing subjects reported "very poor" and none reported "somewhat poor" quality, 33% of the linear subjects reported either "very poor" (11%) or "somewhat poor" (22%) quality in response to this question.

A different pattern emerged, however, when the responses of the inexperienced hearing aid users were examined. In contrast to the experienced hearing aid users, only 43% of the adaptive processing subjects reported "fairly" good quality of speech in noise with their new hearing aids, while 75% of the adaptive processing subjects chose this response. Indeed, none of the linear subjects indicated that the quality of speech was either "very" or "somewhat" poor in quiet, while 43% of the adaptive processing subjects chose "somewhat poor."

Thus, while for the first time there was some indication of advantages for adaptive processing, this advantage only seemed to be for the experienced hearing aid users. It is not entirely clear as to why there would be this advantage in terms of quality of speech in quiet, but the more important question is whether or not this advantage carries through to the noise situation. In terms of the inexperienced subjects with linear circuitry, the observations made may again reflect the pos-

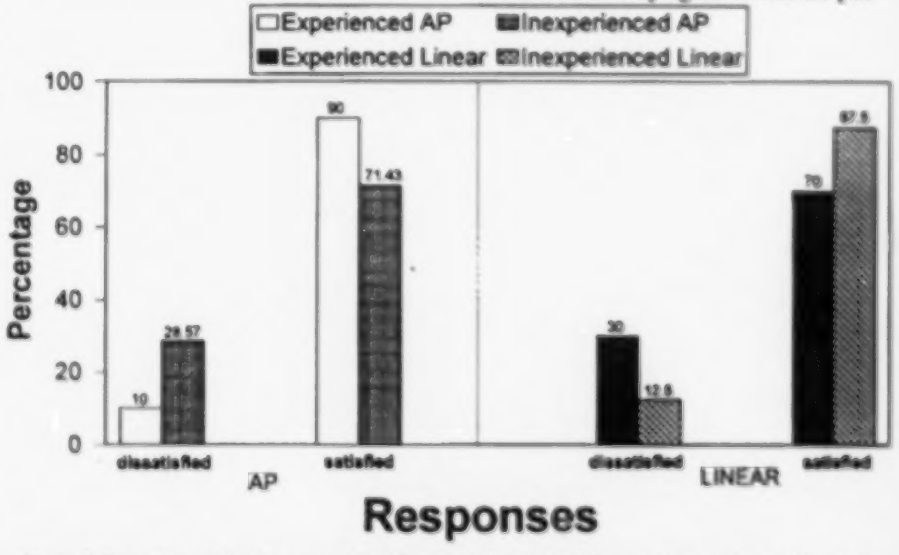

Figure 5. Proportion of adaptive processing (AP) and linear hearing aid users, either with or without prior hearing aid experience, reporting that they were essentially satisfied or dissatisfied with their new hearing aids in response to Question 5 on the questionnaire.

sibility of inherently different speech perception capacities.

The next question asked subjects to rate their overall satisfaction with their new hearing aids. The responses are illustrated in Figure 5. Histograms representing "dissatisfied" are a combination of "very" and somewhat dissatisfied" subject responses. Subject responses for "somewhat" and "very satisfied" are combined and are depicted in the "satisfied" histograms. For the experienced hearing aid users the percentages of adaptive processing subjects who reported being "very" or "somewhat satisfied" were both 10 percentage points higher than those reported by the linear subjects. While 90% of the adaptive processing subjects appeared overall to be satisfied with their new hearing aids, only 70% of the linear subjects indicated relative satisfaction. As with the last question, a slightly reverse pattern emerged for the inexperienced hearing aid subjects. Although overall there appeared to be satisfaction with the new hearing aids, relatively more linear subjects reported being "very satisfied" (75%) than did adaptive processing subjects (14%).

These observations, then, may again be interpreted as suggesting a slight advantage for adaptive processing circuitry, but only for experienced hearing aid users. While the possibility of inherently different speech perception capacity for the inexperienced hearing aid users with linear circuitry still remains an issue from these observations, it is interesting to note that the overall satisfaction with hearing aids was highest both for this group and the experienced hearing aid users with adaptive processing circuitry. It was also these two groups whose responses to Questions 4a and 4b indicated that most subjects were reporting relatively good quality of speech in quiet and noise. Although the inexperienced hearing aid users with linear circuitry also reported relatively good understanding of speech in quiet and noise (Questions 3a and 3b), such was not the case for the experienced hearing aid users with adaptive processing circuitry. Thus, these observations suggest the possibility that overall satisfaction with hearing aids is more influenced by the perceived quality of speech than it is by the understanding of speech, especially in noise.

The last question asked the experienced hearing aid users to compare their new hearing aids to their old ones in terms of satisfaction. The response patterns illustrated in Figure 6 revealed that the greatest percentage of linear subjects (50%) found their new hearing aids to be "somewhat better" than their old hearing aids, while the greatest percentage of adaptive processing subjects (70%) found their new hearing aids to be "much better" than their old one. It was also noted that while no adaptive processing users reported that their new hearing aids were "somewhat worse," 10% of the linear subjects chose this response. Thus, this pattern of results can be interpreted to again suggest an advantage for adaptive processing in terms of hearing aid satisfaction.

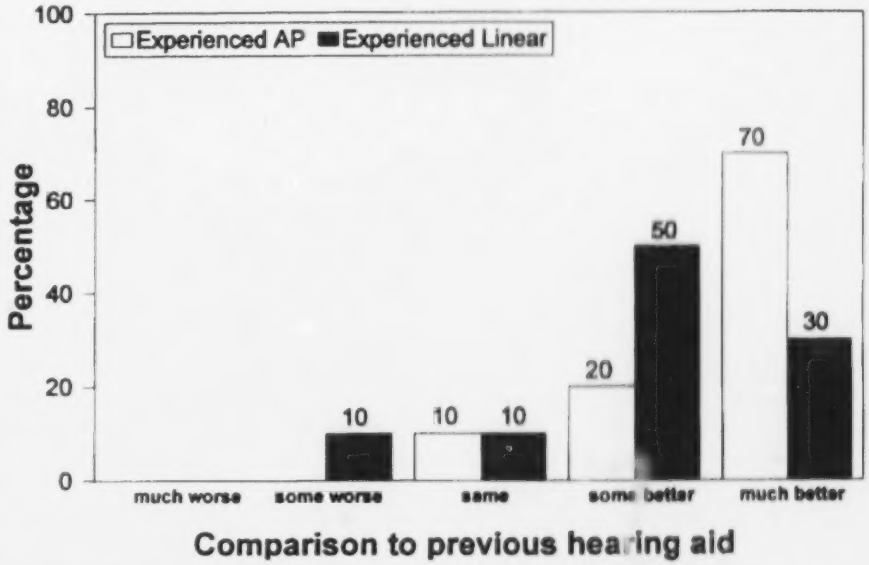

Figure 6. Percentage of experienced hearing users, either with adaptive processing (AP) or linear circuitry, reporting that their new hearing aids were essentially worse, the same, or better than their previous hearing aids in response to Question 6 on the questionnaire.

CONCLUSIONS

This work was undertaken as a first step in examining the factor of experience with amplification on the self-report of benefit from adaptive processing circuitry. The responses of experienced hearing aid users with adaptive processing circuitry were compared to those of subjects with linear processing circuitry. A similar comparison was made for inexperienced hearing aid users.

Observations with the inexperienced linear hearing aid users suggested that they might have had inherently different listening abilities or, perhaps, a different apriori set of expectations for hearing aids than did other inexperienced hearing aid users. Since proportionally more of the inexperienced linear subjects reported little difficulty both in quiet and in noisy situations, it is possible that their unaided hearing was different than that of other subjects. Since subjects were not matched for hearing status, it is not known if this is the case. Another possibility is that the subjects in the inexperienced linear group had a different set of expectations for hearing aid performance than did other subjects resulting in reporting essentially greater satisfaction and benefit. Conversely, it is possible that those subjects given adaptive processing instruments had unrealistically high expectations for improved listening in noise, especially if they knew they had a special "noise reduction" circuitry. Clearly the issues of unaided hearing status and apriori expectations need to be adequately addressed and further researched.

Since the response patterns for the inexperienced linear subjects suggested that they may have had some important differences from subjects in the other three groups, the issues of experience as a factor on reported effectiveness of adaptive processing circuitry is best addressed by comparing only the results for the other three groups. When these comparisons were examined, there did appear to be some advantages for adaptive processing, but only for experienced hearing aid users. That is, in terms of quality of speech in quiet and noise (question 4), the responses of the experienced hearing aid users with adaptive processing were found to be different than the experienced hearing aid users with linear circuitry. In

addition, the percentage of experienced adaptive processing users who were "more" satisfied with their new hearing aids was greater than in the other groups.

Although the observations for quality of speech in noise and satisfaction are encouraging for the use of adaptive processing circuitry, it is also important to remember that there was no indication that adaptive processing was beneficial in terms of how bothersome background noise was perceived to be, ease of listening to speech in noise, or understanding speech in background noise. Indeed, for these questions, linear circuitry often appeared advantageous. Thus, the observations in this study cannot support the clinical use of adaptive circuitry for all patients who report difficulties in noise, but rather, may be support for the use of a trial period with adaptive circuitry for some individuals.

Another interesting observation is that, overall, all hearing aid users, whether new or experienced, or whether using adaptive processing or linear circuitry, reported being essentially satisfied with their new hearing aids. This finding supports Bentler's (1993) contention that a careful clinical approach to fitting hearing instruments may be more critical to patient satisfaction than the type of circuit selected. The absence of carefully matched subjects for hearing abilities or hearing aid expectations, the use of only two adaptive processing circuits, and the relatively small number of subjects necessitate the use of caution when drawing conclusions from the study. The observations made here do suggest that experience is a factor which should be examined in further clinical research to determine the effectiveness of adaptive processing. This is particularly true if the quality of speech and overall satisfaction are believed to be important components of a successful hearing aid fit.

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APPENDIX

QUESTIONNAIRE

1. How **bothersome** is background noise with your new hearing aid? Background noise is very bothersome___somewhat bothersome_____ slightly bothersome_____not bothersome_____
2. Rate the **ease of listening** to speech in background noise. Listening to speech in background noise is very difficult_____somewhat difficult_____ easy_____very easy_____
3. How would you describe your **understanding** of speech with yourhearing aid in the following listening situations?

   a.In quiet (watching TV, when someone is whispering, etc.) I understand speech poorly_____fairly well_____very well_____

   b. In noise (crowds, parties, restaurants, church basements, etc.) I understand speech poorly_____fairly well_____very well_____
4. How would you describe the **quality** of speech with your hearing aid in the following listening situations:

   a.In quiet (watching TV, when someone is whispering, etc.) the quality of speech is: very poor_____somewhat poor_____fairly good_____excellent_____

   b.In noise (crowds, parties, restaurants, church basements, etc.) the quality of speech is: very poor_____somewhat poor_____ fairly good_____excellent_____
5. Rate your overall **satisfaction** with your new hearing aid. Overall, I am: very satisfied_____somewhat satisfied_____ somewhat dissatisfied_____very dissatisfied_____
6. If you wore a hearing aid previously, **compare** your overall level of satisfaction of your new hearing aid with your old hearing aid. Compared to the old hearing aid, the new hearing aid is: much better_____somewhat better_____ the same_____somewhat worse_____ much worse_____never wore hearing aids before_____

AUTHORS NOTES

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Second Language Acquisition In Adolscent Hispanic Students: Guidelines For School Speech-Language Pathologists

Alejandro Brice, Ph.D.

ABSTRACT

As the Hispanic population of the United States continues to increase dramatically, speech-language pathologists face the challenge of how to best provide educational services for those whose primary language is Spanish. The issue is compounded when monolingual English speaking speech-language pathologists must provide services to school students from bilingual or monolingual Spanish speaking homes. For culturally and linguistically diverse (CLD) Hispanic middle school students, the problems with communication are acute due to the high linguistic and contextual demands placed upon them by the academic environment. The purpose of this article is to review information regarding classroom perspectives, pragmatics, language transference, and to present two case studies of adolescent Hispanics with appropriate learner/teacher strategies.

INTRODUCTION

As the Hispanic population of the United States continues to increase dramatically, speech-language pathologists (SLPs) repeatedly face the challenge of how to best provide educational services for those whose primary language is Spanish. Already 25% of North Americans define themselves as Hispanic or non-white (Henry, 1990). The issue is compounded when monolingual speech-language pathologists must provide services to students from bilingual or monolingual Spanish speaking homes. Communication is a major barrier for many Hispanic students. For culturally and linguistically diverse (CLD) Hispanic middle school students, the problems with communication are acute due to the linguistic and contextual demands placed upon them by the academic environment. By the time adolescents reach the middle school, they should exhibit a wide range of linguistic abilities that are critical to school success. In this article I will discuss several factors that should be considered in making programmatic decisions with adolescent Hispanic students. Although the focus of this article is about Hispanic students, the fastest growing non-English speaking population in the United States, the information presented here is relevant to other culturally and linguistically diverse students whose first language is not English.

BACKGROUND

The percentage of Hispanic individuals in the United States has significantly increased within the past decade. In 1989, there were 14.5 million Spanish speakers in the United States and Spanish was spoken by 58% of all speakers of languages other than English (MacArthur, 1993). The number of Spanish speaking school children grew from 2.5 million to 3.6 million between 1979 and 1989 with many of these children exhibiting difficulties in oral English (MacArthur, 1993). Almost half of the Spanish speakers reported speaking English with difficulty.

When one considers the requirements for school success, e.g., seeking information, asking questions, explaining ideas and concepts, and following directions, etc., it should come as no surprise to suggest that these students may be at-risk for school failure (Rosenblatt, 1982).

MacArthur (1993) found that persons who spoke languages other than English were at least twice as likely to drop out of school prior to completing high school than English-only speakers. Other at risk factors include low family incomes, and low parent educational attainment (MacArthur, 1993).

MacArthur (1993) also reported that among foreign born Spanish speakers, those who had immigrated after 1980 had higher drop out rates to those born in the United States. Thus, adolescent Hispanic students enrolled in school today face a difficult and often abbreviated school career when compared to their English-only speaking peers.

CLASSROOM PERSPECTIVES

What is the role of native language influence on learning English with language disordered Hispanics? Some conditions for English learning are summarized and follow. These conditions provide a basis for modifying instruction to enhance English learning with language disordered Hispanic adolescents (those with communication disorders not associated with normal English language learning difficulties). They include:

(a) **Language transference**. In certain grammatical instances language transference may hamper English acquisition. Persons who speak Spanish, Russian, or Italian have more difficulty acquiring and mastering complex grammatical forms of negation (Zobl, 1980). Spanish speakers seem to have difficulty in learning pluralization rules where in Spanish the adjective must agree in number with the noun it is modifying. Hence, an error such as "too manys cats" may occur. This indicates linguistic transference difficulty between Spanish and English (Odlin, 1990).

(b) **Opportunities for Spanish usage**. Spanish language use may also affect English language acquisition. Veltman (1988) found that 38% of Spanish origin persons predominantly spoke English, while, 30% have not entirely dropped Spanish usage but have delegated Spanish to a subordinate status. Seven percent have become English monolinguals and no longer speak Spanish. Veltman concludes that speaking English to children as their mother tongue generally leads to the abandonment of Spanish. The future of the Spanish language in the U.S. will be largely determined by whether Spanish users

choose to use Spanish in the home environment or not.

(c) **Teacher negotiation**. Pica, Young, and Doughty (1987) reported that when students are encouraged to negotiate with teachers (i.e., seek clarification, confirm, or ask for repetition of teacher utterances they do not understand), better comprehension in English is noted.

Teacher strategies such as repetition and rephrasing are not necessary to increase listener comprehension. Thus, simply encouraging students to ask questions seems to have a positive impact on students' understanding classroom lectures.

(d) **Learner opportunities**. Learners need opportunities to modify their language output beyond just hearing comprehensible input (Swain, 1985). Beginning learners of English may have limited opportunities to modify their output because teachers tend to model correct productions and not allow for student mistakes. The student then only has to acknowledge the correct model. Thus, SLPs and teachers need to model less and allow for students to practice their speaking skills. The SLP should also allow for a greater wait time in expecting a response and allow the student to monitor and reflect on her/his spoken utterance.

(e) **Functional conditions**. Wong-Fillmore (1992) identified several functional conditions for learning a second language exist: (1) a need to communicate, (2) access to the language from speakers of that language (peers, teachers, community members), (3) interaction, support, and feedback from others, and (4) close and continued interaction with others lasting 3 or 4 years.

(f) **Classroom interactions**. In classes where the majority of students are Hispanic, greater English proficiency was obtained with student-to-teacher interactions than with student-to-student interactions (Chesterfield, Chesterfield, Hayes-Latimer, & Chavez, 1983).

(g) **Classroom sharing**. Discussions and giving opinions in class do not necessarily lead to increased English acquisition. Pica and Doughty (1985) found that discussion and opinion giving tasks offered limited opportunities for English learning in group activities. However, sharing information with other students did have a positive impact (Pica & Doughty, 1985; Swain, 1985).

(h) **Actions and open-ended questions**. Students talk more if they perform an action first. Also, when teachers asked open-ended requests for clarification versus confirmation checks, (e.g., "What did you mean?" versus "Did you mean ____?"), then students made more linguistic adjustments.

(i) **Drill instruction**. Should students receive drill instruction? Should instruction be more direct? The use of drills and direct instruction (directly teaching the specific micro skills) diminished with the introduction of more naturalistic language instruction (Krashen, 1985). However, Schmidt and Frota (1986) found that use of drills played a significant role in adult learning of a second language because the adult was capable of being attentive to the L2 grammatical feature being highlighted in the drill. Thus, older learners, including adolescents, may benefit from drill and practice language lessons followed by a naturalistic approach to reinforce learned skills. Pienemann (1984) found that direct grammatical instruction facilitates learning when the student is developmentally ready for moving onto the next stage. Students who were not taught the next developmental stage rules did acquire them, however, at a slower rate than those who were directly taught.

(j) **Peer grouping, formal practice**. Some other factors also influence English acquisition, particularly peer grouping and formal practice. Allwright (1980) and Pica (1991) found that quieter students who were at similar English proficiency levels as their classmates benefited from their more interactive peers. Thus, this research calls for similar ability grouping.

ADOLESCENT STUDIES: AN OVERVIEW

Pragmatic skills in Hispanic Adolescent students

Speech-language pathologists (SLPs), English as a second language (ESL) teachers, and regular education teachers all need to be aware of their students' pragmatic functioning. This is necessary in order to assess their language functioning.

Classroom demands increase when students enter the middle school environment (Brice-Heath, 1986; Larson & McKinley, 1987; Simon, 1985). Since pragmatics is one aspect of language, language disordered students may also be expected to display pragmatic problems. Thus, the ability to use language appropriately becomes increasingly complex for adolescent language disordered students. When normal Hispanic students are quickly mainstreamed (after approximately two years in the United States) into regular education classrooms after English as a second language instruction, speech-language pathologists, teachers and administrators with regular education backgrounds may expect these students to perform well in all aspects of language including pragmatics (Cummins, 1984). The period of ESL instruction may not be sufficient for the bilingual students to acquire all the necessary language skills (Collier, 1987, Cummins, 1984). Thus, appropriate identification of students' needs is vital for proper program placement.

Speech-language pathologists and other educational professionals may misinterpret and perceive culturally different behaviors as being indicative of pragmatic disorders. These students may be inappropriately referred to speech and language programs when the most appropriate placement may be the ESL or regular education classroom. The possible misunderstanding of the students' different behaviors may result in their inappropriate referral for special education testing or speech-language testing. Thus, the ability to use language appropriately becomes an issue for adolescent Hispanic students. Consequently, speech-language pathologists and other educational professionals are faced with the task of meeting the appropriate educational needs of Hispanic students and differentiating between a language disorder and the normal second language acquisition process.

Brice and Montgomery (1993; in press) sought out to determine if pragmatics skills of culturally and linguistically diverse adolescents differed if they were identified to receive speech-language services versus English as a second language services. Thus, two separate groups were studied, i.e., Hispanic students receiving English as a second language instruction versus Hispanic bilingual students receiving speech-language therapy. Both groups of students experienced difficulty in school based pragmatic behaviors (Brice, 1992b; Brice & Montgomery, in press). The hypotheses of the study were: (1) the groups differ significantly in their pragmatics performance, (2) this information will help differentiate normal second language acquisition difficul-

ties versus difficulties associated with a language disorder. Pragmatic performance was measured using an established adolescent scale i.e., the *Adolescent Pragmatics Screening Scale (APSS)* (Brice, 1992a).

Results indicated differences on six of the seven pragmatic measures suggested that ESL and bilingual speech and language (BSL) students were unable to regulate others using language. Brice (1992b) and Damico and Damico (1993) suggested that this inability to regulate others may be a cultural trait showing deference to teachers and authority figures. Thus, even language intact students may have some difficulty acquiring this Euro-American pragmatic feature of language making differentiated diagnosis even more difficult.

The BSL disordered adolescents demonstrated a pervasive pragmatics deficit as measured by the *APSS*. The BSL students showed an inability to express themselves in the classroom, to initiate and finish classroom discussions, to listen to classroom discourse and follow teacher directions, and to cue others about the course of classroom discussions. This places the BSL students at high risk for academic failure and possible school dropout. The BSL students also face alienation from their peers by not being able to appropriately use language in a socially interactive context for behaviors such as: greeting others, beginning and terminating personal discussions, listening attentively to what others say, and moving among topics of conversation with ease. These students need to be identified early to prevent the pragmatics problem from becoming an overall pervasive disorder and possibly leading to school failure. Early identification and remediation of pragmatics disorders in culturally and linguistically diverse students appears to be a critical factor for school success.

Language transference in ESL adolescent students

Knowledge of second language learning is necessary for today's school professionals. Rivero and Brice (1994) measured language differences of English and Spanish speaking adolescent students. The language differences were studied with attention to the number of years in an English for speakers of other languages (ESL) program and grade in school. The students were enrolled in middle school grades six through eight. Test students had been receiving ESL instruction for one to three years. Other support services were not required.

The students were tested with the *Language Assessment Battery (LAB) English and Spanish versions Level III (6-8)*. The results of this study point to: (1) marked discrepancies between English and Spanish *LAB* percentile results for all three groups, i.e., years one, two and three in ESL, (2) a slight trend toward increased English proficiency, (3) possible Spanish language maintenance, (4) the higher grade students performed better the than lower grade students , and (5) weak language transference between Spanish and English.

The interdependence hypothesis (Cummins, 1984) proposes that transfer of academic proficiency in the minority language (Spanish) to the majority language (English) will occur given adequate exposure and motivation to learn the majority language. According to this hypothesis, a cognitive/academic proficiency is common to all languages and that proficiency allows for transfer of language related skills across languages. Other studies and reports indicate that reading transfers more readily but writing does not (Carson, Carrell, Silberstein, Kroll, & Kuehn, 1990; Pica, 1994). The results of this study also suggest that developing reading language skills in English (L2) may be affected by language capacities in Spanish (L1).

CASE STUDIES

Case studies or case methods have been recommended as a means of illustration for teacher learners (Johnson, 1995). She stated that use of case methods is one way in which teacher educators can create opportunities for new teachers to use their emerging knowledge about teaching that is similar to how real teachers use real knowledge in classrooms. What follows are two case studies illustrating teaching strategies in developing pragmatic skills and classroom based learning skills.

Case study one: Pragmatics

Jose' is an eleven year old male enrolled in sixth grade (middle school) in southern California. His first language was Spanish and both parents continue to use Spanish in the home. Jose' was born in the United States and began school in the U.S. seven years ago, in kindergarten. He was found to have limited English language proficiency even after seven years of school enrollment. Jose' is enrolled for speech and language therapy and special education classes.

Jose' was evaluated by his SLP and Special Education teacher for pragmatic difficulties and was found to have the most difficulties with the pragmatic areas of (a) cueing the listener regarding topic shifts, (b) listening actively, and (c) initiating and maintaining conversations. Further, Jose' was found to have little difficulty greeting others. Under the pragmatic topic of Affects Listener's Behavior Through Language (a regulatory function), the Special Education teacher commented that, "He is very hyper and the youngest in his family... mother deceased... very spoiled and lazy. Accepts no responsibility for accountability."

It is apparent that Jose' is experiencing learning problems reflected by his poor pragmatics, limited English language abilities, possible attention deficit disorder problems, and poor portrayal of his abilities to his teacher(s) (note the teacher comment of "very spoiled and lazy"). Jose's exposure to English has not been sufficient to enable him to become proficient due to the presence of a language learning disability.

Jose' is experiencing difficulties with listening, initiating, and maintaining classroom discussions. He does not seem to possess meta-pragmatic skills and know how to monitor and adjust his conversation. Jose' is also experiencing similar communication problems in Spanish, i.e., listening, initiating and maintaining personal conversations. Speech-language services should address Jose's limited English language skills by having the SLP provide written copies of directions and assignments to compliment oral instruction, build lessons on understanding background knowledge for textbook lessons, and teach self-study skills such as note taking, self-questioning, organizing, and test-taking. The latter skills may assist Jose' with classroom listening skills.

Jose' is having difficulty starting and maintaining classroom discourse. In particular he is having difficulties not interrupting others, and giving an answer within a reasonable amount of time. Jose' may need direct instruction to teach waiting for others to speak before he makes a comment. He may have a peer teacher remind him when to make comments in class discussions. Classroom rules for

discourse may need to be reviewed periodically with him to ensure that he has learned them. The SLP may need to work with the classroom teacher in giving Jose' more time to formulate his thoughts. However, the classroom teacher may need to prompt Jose' for a response after a specified period of time (e.g., 10 to 15 seconds).

Meta-pragmatic strategies may enable Jose' to monitor his speech. A modified cognitive behavior modification technique may be useful (Rooney & Hallahan, 1985) in helping Jose' monitor his listener to see if he/she is following the conversation. Initially, the SLP may have to review what troubled expressions (i.e., "I don't understand") look like. Jose's SLP might then implement a four step process of: (1) The SLP models the self-questioning strategy ("Does the listener understand me?", "What can I say to clarify?"), (2) Jose' performs the strategy while verbalizing the strategy, (3) Jose' whispers while performing the strategy, and (4) Jose' performs the strategy using covert speech as a guide.

In sum, Jose' exhibits difficulties characteristic of many adolescent middle school students enrolled for both speech-language therapy and special education. Some modifications have been made to accommodate his Hispanic cultural upbringing, i.e., having the SLP and teacher allow for a longer wait time for responses. It is recommended that Jose' receive a complete Spanish/English speech and language assessment by a bilingual speech-language pathologist.

Case study two: Listening and literacy skills

Evelyn is a 14 year old enrolled in the eighth grade (middle school) in southern Florida. She has been enrolled in the ESL program for three years. Her first language was Spanish and both parents continue to use Spanish in the home. Evelyn was born in Columbia and came to this country three years ago. Evelyn is receiving English as a second language (ESL) instruction for her content instruction. She is not receiving any other support services.

Evelyn was tested with the *Language Assessment Battery (LAB)* Spanish and English versions. Her performance indicates that all skills tested (i.e., listening, reading, writing) were higher in Spanish than English. Her Spanish percentile score was 94, while her English percentile score was 38. An English LAB score of less than 40% indicates that an ESL student may have greater difficulty in transitioning from one language to another (Rivero & Brice, 1994). This is the case with Evelyn. In both Spanish and English her better abilities included writing, followed by listening and then reading.

According to district criteria in the state of Florida, Evelyn is ready to be exited out of the program, i.e., 33rd total percentile score on a standardized English assessment measure. However, she may still experience cognitive academic language proficiency (CALP) problems as indicated by her lower English scores. Collier (1987) stated that an adolescent student may take up to seven years to acquire CALP proficiency in the second language when he/she has adequate proficiency in their first language. Thus, Evelyn may continue to experience language and academic problems.

Listening skills seem to be a primary concern for Evelyn since most classroom instruction is very dependent on this skill (Secord, 1994).

The four basic strategies that will enable Evelyn to acquire better listening skills include rehearsal, elaboration, organization and monitoring.

Rehearsal strategies may include shadowing, where Evelyn repeats (in a whisper) what the teacher said or writes down key words from what the teacher has said. Elaboration tasks may include forming a mental image of two elements of what the teacher has said and generating a sentence that connects the two. In listening and remembering vocabulary Evelyn may use the keyword method. This involves an acoustic link and an imagery link. For example, the word "disk" in disk-drive is similar to the Spanish word of "disco" (LP record). The acoustic link might be the word "disco". The imagery link might consist of a disk or LP record driving a car. For an organization listening strategy, Evelyn might be taught to use clustering by having her organize items from a list (that the teacher may read) into groups based on shared characteristics. For example, clustering items according to shape and size in a mathematics lesson.

Reading is another area of concern for Evelyn. A shared book activity may be utilized with similar level Hispanic students. The teacher consulting with the SLP should select a suitable story that possess strong, temporal organization, be consistent with Evelyn's experiences, and be motivational. The teacher should have Evelyn (perhaps with a partner) highlight key words and phrases, develop physical props as backdrops for the story, and develop charts for the story relationship.

The teacher and SLP may want to develop a dialogue journal with Evelyn. The dialogue journal may be implemented as follows: (a) Evelyn and the teacher or speech-language pathologist write each other on a regular basis on whatever Evelyn finds interesting, (b) all entries are confidential, (c) the teacher and SLP respond only to the content of the entry and not to grammar or spelling errors, (d) each entry should take five to ten minutes to write, (e) the teacher and SLP comment, expand, or ask questions about the entry. Although the dialogue involves writing, it is being used here as a reading tool. Cognitive processing is also being addressed with more integration of information, more generalization, and a broader perspective.

In sum, Evelyn presents some normal difficulties in acquiring a second language, particularly listening and reading skills. She does not present a language disorder; however, she may be referred for speech and language testing because of her continued classroom difficulties, albeit normal, after being dismissed from the ESL program (Cummins, 1984). The SLP should play a consultative role to the teacher on how to implement strategies that address listening, reading, and writing. Some strategies have been given here such as use of dialogue journals and shared reading activities. Some strategies to promote learning for Evelyn which may facilitate better English acquisition are presented in Table One.

CONCLUSION

Pragmatics for students in middle or secondary school is an important aspect of functioning within the classroom. Culturally and linguistically diverse Hispanic students and Hispanic students with language communication disorders may need instruction in pragmatics skills. It is important for school personnel to be aware of pragmatics in order to assist Hispanic students and language disordered Hispanic students in their education. Comparison of pragmatic skills across groups should assist school per-

Table 1. Guidelines for Promoting Learning With Hispanic Adolescents.

Seven tips from the Institute for Educational Research (cited in American Teacher, 1990).

1. Provide written copies of directions and assignments to compliment oral instruction.
2. Be an example of correct language. Correct Hispanic student's errors only during formal instruction.
3. Don't restrict Hispanic students to the basics. Keep expectations high and engage students in tasks that require higher level thinking.
4. Students who may seem proficient in conversational English (oral language skills) may still need help with academic language tasks, including following instructions and understanding subject specific vocabulary.
5. Build lessons on understanding background knowledge for textbook readings.
6. Keep Hispanic students involved by asking prediction questions, such as "What do you think... ?"
7. Teach self-study skills such as note taking, self-questioning, organizing, and test-taking.

sonnel in making proper educational decisions for their students. In turn, all Hispanic students will have increased opportunities to acquire the skills they need to function as competent communicators in their schools and in society.

Listening, reading, and writing transference of skills from Spanish to English is vital if Hispanic adolescent students are to remain in school and not drop out. From the work of MacArthur (1993) and Veltman (1988), it is clear that Hispanic students face difficulties that monolingual English speaking students or students speaking other languages do not face. The SLP with her/his knowledge of language, learning and strategies can assist other professionals through pre-referral intervention or through consultation. The speech-language pathologist should assume the role of becoming a specialist in cultural diversity since she/he may lead assessment teams. It is vital that the SLP take an active role in all Hispanic students' education. In sum, awareness of and sensitivity to persons who differ in culture, language, or ability, are critical to the success of culturally diverse education programs.

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Gross Examination Of The Vestibular System: A Tutorial

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ABSTRACT

Audiologists are more and more often the first or second clinician to evaluate the balance impaired client. The cogent factors of a dizziness case history, how these factors relate to pathology and some gross vestibular tests are described to assist audiologists in the early identification and documentation of vestibular pathology. Audiologists are encouraged to use such procedures in a select and efficient manner to better serve the balance impaired client.

INTRODUCTION

Vestibular system disorders are complex and therefore difficult to diagnose. Adding to this complexity is the vestibular system's capability to resolve acute malfunctions. This may only be a matter of days for young adults (Yagi & Markham, 1984). It is therefore prudent clinical practice to perform some gross vestibular measurement at the time the client is initially seen such as at the time of the initial audiometric examination. In this way signs and symptoms of vestibular dysfunction can be documented for comparison with past and/or future examinations of the balance system. Additionally, these measures can assist the audiologist and physician in deciding whether the client is a candidate for formal testing by electronystagmography (ENG), emergent medical care or rehabilitation measures.

A complaint of dizziness is one of the most common confronted by the examining physician and not infrequently confronted by the audiologist. The term "dizzy" is often used by the client to describe his or her altered orientation to the environment (Rubenstein, et al, 1988; Drachman & Hart, 1972). It is a confusing diagnostic term because there are varying dizziness symptoms, degrees of severity and multiple potential sites for pathology. The source of dizziness may be a lesion affecting vestibular, proprioceptive or visual mechanisms, altering the synthesis with which these balance maintaining systems work. The etiology may also be wholly functional. In addition to disorders affecting peripheral organs, any change in brain centers that carry and integrate balance maintaining signals may result in the sensation and complaint of dizziness. Finally, support systems (e.g. the vascular system) must be healthy to maintain equilibrium (Busis, 1973; Baloh & Honrubia, 1990). The audiologist's challenge in the diagnostic process is to detail what the client means by dizziness, understanding symptoms described and observe signs indicative of a balance disorder. This tutorial is intended for audiologists who concern themselves with balance disordered clients.

THE DIZZINESS HISTORY

A first action to be considered therefore is a complete case history. This may be done verbally using open or closed set questions or by the use of a standardized dizziness questionnaire (e.g. Goodhill, 1979). Suggested elements of an ideal dizziness case history questionnaire are: identification of predisposing factors (disorders preceding the dizziness onset which may have caused the dizziness); date of onset; presence of tinnitus; presence of hearing loss; a history of otological surgery; resolution or worsening of symptoms over time; effect of prescribed medications on dizziness; characterization of the dizziness as a spinning sensation, lightheaded sensation, a visual disturbance or any of these factors in combination; whether the dizziness is constant or periodic; duration of dizziness symptoms and any associated visual blurring if these symptoms are periodic; identification of any associated symptoms such as aural fullness and hearing loss during a dizziness episode; identification of any precipitating factors (factors that precede each and every episode of dizziness); history of any previous occurrences similar to current symptoms; family history and previous ENG examinations.

Based on this information some conclusion may be drawn regarding the probable cause or causes of the vestibular signs and symptoms. Historical information such as illnesses that precede the onset of dizziness may help to identify an infectious disease that may have caused the balance disorder for example. A history that relates changes over time such as a temporary resolution of symptoms, can guide the audiologist in differentiating an acute disorder from a subacute or chronic disorder. Medications intended to relieve a presumed peripheral pathology usually do work so that an indication to the contrary should lead the clinician to consider alternate diagnostic categories.

ON RELATING THE HISTORY TO PATHOLOGY

Symptoms of "dizziness" may be grouped into three basic categories: vertigo, disorders of imbalance and visual disturbances (Baloh, 1984). Dizziness may be an illusion of movement, that is, a spinning sensation similar to that of a merry-go-round experience or dizziness may be characterized as a lightheadedness sensation or giddiness. A

sensation of spinning or true vertigo, nearly always indicates a vestibular system disorder, that is, a disorder within the sensorineural mechanism itself (Van Egmond, et al, 1949; Wilson & Melvill, 1979). Formal testing and close follow-up are strongly recommended. These symptoms are usually acute, severe and short-lived. Clients will often liken their vertigo symptoms to that of being drunk or severe motion sickness. Predisposing factors may include a recent cold or flu. The course of vestibular disorders commonly provides for periodic return of the symptoms. Some precipitating factors include head movements or changes in body position. Common associated symptoms, which are not easily controlled, include nausea, vomiting, unsteadiness, a tendency to stagger to a specific side when walking, tinnitus, hearing loss and occasional visual blurring.

Disorders of balance may or may not be associated with vertigo. Also, lightheadedness complaints are nearly always non-vestibular symptoms, that is, the primary cause of the sensation is not usually a disorder within the labyrinth and primary afferent nerve (Onrot, et al, 1986). Formal testing is recommended should these symptoms persist more than two weeks, increase quickly in severity or at the discretion of the audiologist. Predisposing factors for lightheadedness may include cardio-vascular disease or many peripheral sensory disorders that affect hearing, vision, and/or touch at the same time. The course of the disorder is usually constant although brief lightheadedness associated with a person raising from a seated to a standing position is a common finding in presyncopy (a near fainting spell) due to orthostatic hypotension (significant but temporary drops in blood pressure) (Hale, Stewart & Markes, 1984). Some common precipitating factors for lightheadedness include stress, hyperventilation, cardiac arrhythmia and acute anxiety. Common associated symptoms include perspiration, tension headache, alterations in breathing and difficulty concentrating. A history of this sort may lead to specific disorders such as hyperventilation syndrome, multisensory dizziness or may be quite nonspecific and rely on the outcome of formal testing to rule out vestibular system involvement.

Imbalance associated with light-headedness usually do not have as acute nor as severe a symptomology as vertigo, that is, vertigo symptoms are often worse or more troubling. Clients will relate a constant or periodic inability to maintain balance in normal everyday situations. These symptoms may be worse in darkness than daylight because the vestibular system is being relied upon more than the visual system in darkened environments. A common complaint is that a person missteps when walking or consistently bumps a particular shoulder in a hallway. Acute vertigo symptoms are usually vestibular system disorders. Vertigo-associated disorders that are not associated with neurologic symptoms are usually the result of a non-acute unilateral peripheral vestibular lesion. Imbalance present without true vertigo are bilateral peripheral vestibular lesions, lesions of the proprioceptive system or cerebellar lesions (Simmons, 1973; Chambers, Mai & Barber, 1985). Usually imbalance that is worse in a dark environment stems from a bilateral peripheral vestibular disorder and/or a proprioceptive lesions, while lesions of the cerebellum result in imbalance regardless of the lighting situation and visual ability. Complains of "imbalance" are diagnostically sinister and require formal diagnostic testing. This diagnostic testing is performed to rule out disease within the peripheral vestibular system that may already be compensated for by the central nervous system. Vestibular schwannoma is an example. Finally, constant symptoms should lead the audiologist to suspect central nervous system (CNS) disorders while periodic symptoms usually result from peripheral sensory disorders.

Causes of visual disturbances may range in terms of diagnostic significance from focal lesion of the central vestibulo-ocular pathway to a new eyeglass prescription. Any change in visual ability or eyeglass wear must be documented as a predisposing factor. A common visual disturbance associated with a unilateral vestibular paresis is occasionally blurred vision where the asymmetry in tonic labyrinthine output results in a reflexive eye movement called nystagmus (Bronstein & Hood, 1987). Many clients have a vague dizziness symptom and headache when first fit with new eyeglasses. These symptoms are usually mild and of short duration. An uncommon visual disturbance is oscillopsia where visual monitoring of one's environment is reported to oscillate uncontrollably. Like the video taping of a scene while the camera person is running, oscillopsia is the optic illusion that stationary objects are moving. This is usually due to a bilateral breakdown in the vestibulo-ocular reflex arc and it's ability to provide correct compensatory eye movements in response to head movements.

The symptom of oscillopsia will be associated with transient vertigo and spontaneous nystagmus in cases of an acute unilateral vestibular paresis. In cases where the symptom is only associated with head movement, a unilateral peripheral vestibular paresis is suspect while in cases where the symptom is constant a bilateral vestibular paresis is suspect. In both cases a central nervous system disorder needs to be ruled out (Chambers, Mai & Barber, 1985). In the first case the visual disturbance is transient and secondary to spontaneous nystagmus which creates the visual illusion that objects are moving horizontally (in the direction of the fast phase of the nystagmus). In the latter case, compensatory eye movements are not adequately provided for due to the loss of the vestibulo-ocular reflex and the pursuit system's inability to compensate for this loss at high frequency head oscillations. Also, when oscillopsia is a constant symptom, disorders of the cerebellum may leave clients with an inability to suppress any vestibulo-ocular reflex through visual fixation. (Chambers, Mai and Barber, 1985). As a result, these clients experience brief episodes of oscillopsia that persist after every rapid head movement. Formal testing will provide analysis and hard copy records of these signs and symptoms for differential diagnosis. Complaints of visual disturbances other than oscillopsia and visual blurring usually result in normal ENG findings and referral to eye and neurologic specialists. Any recent disconjugate eye movements where the eyes fail to work as "a yoked pair" may result in double vision (diplopia) and should be considered as a neuromuscular and/or CNS disorder.

GROSS EXAMINATION

Suggested informal tests of vestibular system dysfunction include otoscopy, examination of extra-ocular eye movements, examination of vestibulo-spinal interaction and examination of vestibulo-ocular interaction (See Table 1). Otoscopy provides the audiologist with an index of the general health of the conductive

mechanism. Observations of external ear damage, debris and/or desquamation may support a history of ear trauma or recent otitis. Observations of the tympanic membrane can reflect the current and previous health of the middle ear. Otoscopy will also confirm common surgical modifications of the conductive mechanism and guide the clinician in anticipating caloric irrigation complications.

There are many gross examinations to test for vestibular system dysfunction. Of these examinations those that can quickly expose a unilateral vestibular paresis and pathologic nystagmus for the busy audiology clinic are among the gross examinations discussed here. These include examinations of eye movements done by use of a fixation target such as the examiner's fingers, pen, otoscope or ear light. The client is asked to stabilize the head using the eyes alone to follow the examiner's target. Horizontal tests of pursuit, saccades, and gaze may be completed. The initial tests are evaluations of eye movements such as the pursuit and saccade visual subsystems while gaze testing is a search for pathologic nystagmus.

TABLE 1: Gross Evaluations Of The Vestibular System

EXAM	SITE	TIME TAKEN
History	Multiple	Variable
Otoscopy	Outer Ear	30 Seconds
Pursuit	Neuro-Opthamalogic	30 Seconds
Saccades	Neuro-Opthamalogic	30 Seconds
Horizontal Gaze	Neuro-Opthamalogic	30 Seconds
Past Point	Vestibulo-Spinal	2 Minutes
Sharpened Romberg	Vestibulo-Spinal	5 Minutes
Head Shake	Vestibulo-Ocular	2 Minutes
Dix-Hallpike	Vestibular	10 Minutes

GROSS EYE MOVEMENT TESTS

The pursuit test, a screening eye movement examination, is completed with the client seated and the head kept still. Evaluating only horizontal eye movements is adequate. The pursuit visual subsystem is examined by moving the fixation target left and right of the eye-level horizontal plane at a frequency of about 1 Hz.(Figure 1). A normal finding is conjugate, smooth and continuous horizontal eye movements while interruptions (cog-wheeling) are considered abnormal (ICS Medical, 1988). For this study, eye movement interruptions to one side will indicate either a central vestibular system disorder lateralized to this same side or a transient contralateral impairment secondary to an acute unilateral vestibular paresis. A bilateral pursuit impairment suggests a central vestibular system disorder. The audiologist must be aware that pursuit performance is age-dependent. In the elderly client conclusions regarding the presence of central pathology based solely upon aberrations found in an examination of gross pursuit should be made with great care and reservation.

Figure 1. Horizontal Pursuit Testing

The Pursuit visual subsystem is examined by moving a fixation target left and right of the eye-level horizontal plane at about one cycle per second.

The saccadic visual subsystem is examined by the audiologist holding two visual targets in the horizontal plane at eye level such that the client can see each target when looking to the extreme left and right. Saccades are voluntarily induced by asking the client to look or gaze quickly right or left upon command (Figure 2). These eye movements are normally quick, ballistic, conjugate and accurate eye movements (Weber & Daroff, 1971). Findings other than these are considered abnormal. Disorders of saccadic eye movement are nearly always a central finding. Peripheral vestibular lesions have little or no effect upon saccadic eye movements (Ritchie, 1976).

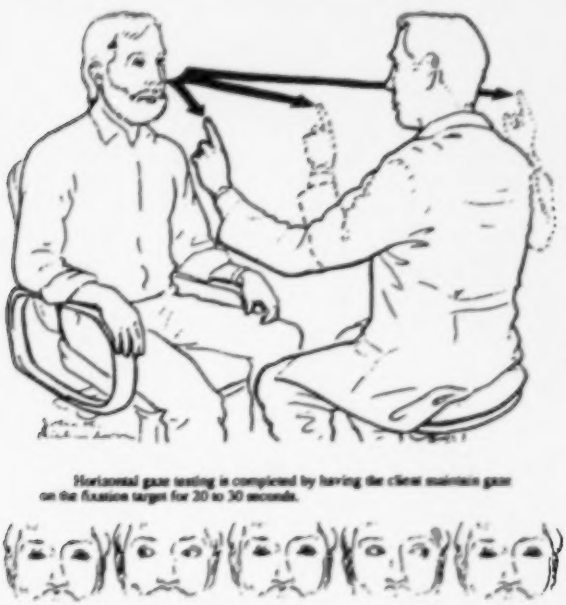
Horizontal gaze testing is an attempt to identify the presence and type(s) of pathologic nystagmus (Coats, 1986). This examination is completed by having the client maintain gaze on a fixation target for 20 to 30 seconds at the following gaze target locations: center, right, center, left and center (Figure 3). A normal exam is free of nystagmus and the client is able to maintain each gaze position over a half minute period of time. An approximation of 30 to 40 degrees visual angle is made when the iris of the eye ball meets the outer canthi (personal experience). Horizontal gaze testing beyond 30 to 40 degrees visual angle induces physiologic or "end-point" nystagmus which is found in most normal subjects (Abel, et al, 1978).

An acute unilateral vestibular paresis may provide spontaneous nystagmus with

Figure 2. Horizontal Saccade Test

Saccades are voluntarily induced by asking the client to look or gaze quickly and alternately right and left upon command.

Figure 3. **Horizontal Gaze Testing**



Horizontal gaze testing is completed by having the client maintain gaze on the fixation target for 20 to 30 seconds.

eyes open and fixed. This nystagmus will be direction-fixed beating away from the impaired ear and follow Alexander's Law (Robinson, et al, 1984). According to Alexander's Law, gaze in the direction of the fast component (toward the healthy ear) increases the frequency and the amplitude of the nystagmus. Gaze in the opposite direction has the reverse effect. Nystagmus evoked purely by gaze and/or eye position change is nearly always an index of central pathology (Leigh & Zee, 1990). These nystagmus findings of central origin are typically disconjugate, direction-changing or nystagmus of the vertical plane. These include disassociated or disconjugate nystagmus, gaze paretic nystagmus, down-beating nystagmus and rebound nystagmus. Some varieties of congenital nystagmus occur only on lateral gaze but the long history of this eye movement, it's characteristic high frequency mono-phasic waveform and null point will assist the audiologist in differentiating congenital nystagmus from pathologic nystagmus of central origin (Baloh, 1984).

GROSS VESTIBULO-SPINAL TESTS

In addition to eye movement and gaze testing, two examinations of vestibulospinal interactions are suggested here to evaluate loss of sensorineural function. The past pointing examination refers to a consistent direction-fixed drift of the upper extremities caused by an imbalance of the peripheral vestibular system (Baloh & Honrubia, 1990). This test represents the medical profession's earliest attempt to clinically assess vestibular function. This examination is performed with the client seated, head and torso kept still, and with the client's arm and index finger extended forward at shoulder level to meet the audiologist's finger (Figure 4). Practiced first with opened eyes and then conducted with eye closure the client is asked to raise the arm and index finger to a vertical position placing the arm along side of the ear and returning it to the audiologist's finger in a smooth, leisurely manner. Both arms are tested. Consistent drift or deviation to one side regardless of the arm used, is a "positive" past pointing and usually the direction of drift indicates the side of lesion.

The sharpened Romberg test places the client in a standing position with one foot placed directly in front of the other in a heel-to-toe fashion. The arms are then crossed against the chest and the eyes are closed (Figure 5). Elderly clients may need to stabilize themselves a few seconds fixating upon the audiologist's face or chest before eye closure. A positive sharpened Romberg is a direction-fixed deviation of the upper torso to one side which is typically the side of pathology (Fregly, 1974). For this examination it is suggested that the client be standing with their back against a wall and the audiologist in front. In the unlikely event of an abrupt fall the wall may used as support and to prevent a backwards fall.

Figure 4. **The Past Pointing Test**

This examination is performed with the client seated, head and torso kept still, and with the client's arm and index finger extended forward at shoulder level to meet the clinician's finger. Practiced first with eyes open and then conducted with eye closure, the client is asked to raise the arm and index finger to a vertical position, placing the arm alongside of the ear and returning it to the examiner's finger in a smooth, liesurely manner.

Both examinations above (Past Pointing and Sharpened Romberg) may be misleading depending upon the time course and severity of a presumed sensorineural lesion. Both examinations are completed using the majority of findings for a 3 out

Figure 5. **The Sharpened Romberg Test**

The sharpened Romberg Test places the client in a standing position with one foot placed directly in front of the other in a heel-to-toe fashion. The arms are then crossed against the chest and the eyes are closed.

of 5 session. An acute unilateral sensorineural lesion will usually present itself as a consistent deviation toward the side of lesion and opposite the direction of the fast phase of any spontaneous nystagmus. Disorders of the central vestibular system, specifically the cerebellum, or a bilateral loss of sensorineural function will result in the client's inability to perform the task normally and a loss of direction-fixed findings. Usually in cases of CNS disease there is an inability to maintain the Romberg position with the client's eyes open and fixed upon a stationary object. The sharpened Romberg test is age-dependent in that most normal clients under the age of 70 years can maintain the Romberg position for about 30 seconds (Baloh & Honrubia, 1990). Older clients and those with either central disease or a bilateral sensorineural loss can not. Additionally, the general health of the client's upper and lower extremities must be considered before valid interpretations can be made.

GROSS EXAMS OF VESTIBULO-OCULAR REFLEX

A gross examination from which vestibulo-ocular reflex asymmetry can be detected is the head-shaking test. Clients with a well compensated peripheral vestibular system imbalance will briefly produce spontaneous nystagmus after vigorous head shaking (Hain, et al, 1987). The test is performed with the client seated, eyes closed and with horizontal head shaking from shoulder to shoulder as fast as possible for about 10 seconds (Figure 6). With the head returned to a stationary position and eyes opened, evidence of spontaneous nystagmus indicates an imbalance within the system and is abnormal.

Figure 6. **The Head Shake Test**

The Headshake Test is performed with the client seated, eyes closed and with horizontal head shaking from shoulder to shoulder for about 10 seconds as fast as possible.

The final gross examination is another attempt to observe whether pathologic nystagmus can be provoked by a rapid change in head position. This examination is the Dix-Hallpike maneuver and nystagmus usually results from pathological changes to the posterior semicircular canal. This finding of nystagmus and the usual associated vertigo is termed benign paroxysmal positioning vertigo (BPPV) (Schuknecht & Ruby, 1973). The Dix-Hallpike maneuver is performed on an examination table or if necessary, on the floor. History of back and neck injury and/or pain is first checked and may contraindicate this procedure. Usually on a three-count (on "three") the client is taken from a seated to a supine position. The audiologist must assist the client with hands-on support of the head and/or neck and the client's head must be at a 45 degree angle. The upper torso and head are assisted downward at a rapid pace with eyes open and the head is allowed to dip below shoulder level once supine (Figure 7). This examination is performed with the "head right" and then repeated for "head left". The nystagmus which may result is an abnormal (positive) finding. This nystagmus will typically have a delayed onset of about 5 to 10 seconds, a brisk onset of horizontal and vertical (horizonto-rotary) nystagmus, associated client complaints of vertigo and discomfort and then a gradual resolution of both the nystagmus and discomfort within 30 seconds.

Figure 6. **The Dix-Hallpike Maneuver**

The Dix-Hallpike Maneuver is performed on an examination table (or on the floor) after checking the client's history for back and neck injury and/or pain. The client is taken, usually on a three-count (on "three"), from a seated to a supine position. The clinician must assist the client with hands-on support of the head and/or neck and the client's head must be at a *45 degree angle*. The upper torso and head are assisted downward at a rapid pace with eyes open, and the head is allowed to dip below shoulder level once supine (Figure 7). This examination is performed with the head right and then the head left.

This nystagmus is usually geotropic (fast-phase beating toward the floor) and also usually fatigues upon repeated maneuvers. Benign paroxysmal positioning vertigo and nystagmus are reliable signs of a biomechanical labyrinthine disorder, specifically involving the posterior semicircular canal of the under-most ear. It is a common finding in both aging clients and post head-injury cases (Brandt, 1990). Central lesions of the brainstem and cerebellum may also produce positioning nystagmus but with different characteristics. Positioning nystagmus of central origin lacks a latent period of onset, is not fatiguable, will usually persist for much greater than 30 seconds and may be direction-changing (Cawthorn & Hinchcliffe, 1961).

It should be noted that any single finding in isolation can be misleading and therefore should not be considered. Rather, these measures utilized as a battery will assist the audiologist in formulating some important first impressions: 1) is formal testing by electronystagmography possible? 2) will such testing be beneficial or torturous for the pediatric or geriatric client? 3) the audiologist will gain a current and documentable diagnostic impression of normal function versus sensorineural dysfunction versus central pathology. Finally, at the time of ENG testing a reassessment of the cli-

ent's vestibular system can be made and further information is therefore available regarding the character of any disorder.

CONCLUSIONS: Providing an immediate historical and gross balance examination will only enhance both the audiologist's diagnostic information and services provided to the balance-impaired client. The procedures described are suggested to assist audiologists in busy diagnostic settings or who must refer for formal ENG testing. Test conditions which describe eye closure can preferably be completed with the use of Frenzel's lens. Historical information to assist in the diagnosis of balance disorders may be obtained verbally or in written questionnaire formats. This procedure will provide important first impressions and comparisons of symptoms for the audiologist and the treating physician. Gross vestibular examinations may result in the observation of signs or client testimony regarding symptoms of balance disorders. These assist in the decision making process in considering formal testing. The audiologist is encouraged to use such procedures to better serve the balance-impaired client in a select and efficient manner.

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Treatment Of Dysphagia Resulting From Cricopharyngeal Dysfunction With Botox: Preliminary Thoughts And Observations

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ABSTRACT

A case of dysphagia resulting from cricopharyngeal dysfunction secondary to brainstem infarct is reported. The most frequent intervention for cricopharyngeal dystonia is myotomy. In this case, injection of Botulinum toxin (BOTOX) into the cricopharyngeus was utilized as an alternative and precursor for possible eventual myotomy. After an initially surgical procedure, a less invasive clinical method was devised to administer the BOTOX to the involved affected muscle via the working channel of an endoscope. The patient reported complete relief from dysphagic symptoms within two weeks after undergoing the procedure. Diet was advanced from NPO to regular (geriatric) diet with liquids. Factors influencing duration of benefit enjoyed and future refinement of the procedure are discussed.

INTRODUCTION

Dysphagia has frequently been reported in patients who have suffered a cerebrovascular accident (CVA), particularly lesions involving the motor cortex or the brainstem (Meadows, 1973; Donner, 1974; Kilman & Goyal, 1976; Veis & Logemann, 1985; Robbins & Levine, 1988). Dysphagia resulting from brainstem stroke frequently involves the inability of the usually tonic upper esophageal sphincter, the cricopharyngeus m., to relax (Silbiger, Pikelny & Donner, 1967; Schultz, Niemtzow, Jacobs & Naso, 1979). The sympathetic nervous system is thought to control tonicity of the sphincter, while the relaxation of the cricopharyngeus is mediated primarily by the vagus nerve (Baredes, 1988). Transient sphincteric relaxation normally occurs during swallow, and passage of bolus material through the cricopharyngeus is accomplished by a combination of propulsive forces superiorly and superior-anterior excursion of the laryngeal complex (Bosma, Donner, Tanaka & Robertson, 1986; Miller, 1986; Dodds, 1989). In instances of cricopharyngeal dysfunction, i.e., achalasia, bolus material entering the pharynx during swallowing becomes static as its passage into the esophagus is impeded or prevented. As subsequent material is ingested and collects within the pharynx, the larynx and airway soon become the path of least resistance, and the excessive food or liquid is aspirated.

While several swallowing therapy strategies have been described (Schultz, Niemtzow, Jacobs & Naso, 1979; Bartolme & Neumann, 1993), and dilatation of the cricopharyngeal sphincter with weighted bougies has been reported with some temporary success (Palmer, 1974; Calcaterra, Kadell & Ward, 1975), the usual treatment for this dysfunction is cricopharyngeal myotomy (Chodosh, 1975; Ellis, 1980; Black, 1981; Logemann, 1983; Baredes, 1988). Candidacy for cricopharyngeal myotomy is predicated upon several criteria, including relative sparing of other components of swallow function, good esophageal peristalsis with no hiatal hernia or history of gastroesophageal reflux, and ability to attain closure of the airway while swallowing (Wilkins, 1964; Blakeley, Garety & Smith, 1968; Aki & Blakeley, 1974). Complications of cricopharyngeal myotomy include persistent dysphagia secondary to incomplete muscle resection, worsening the effects of gastroesophageal reflux and/or esophageal dysmotility, damage to the recurrent laryngeal nerve, and pharyngoesophageal mucosal perforation (Lund, 1968; Baredes, 1988). The procedure is irreversible.

Botulinum toxin (BOTOX) has been used to treat a variety of specific dystonias including blepharospasm, spasmodic dysphonia, facial tics, tortocollis, temporomandibular joint disorder, and achalasia of the lower esophageal sphincter (Brin, Blitzer, Fahn, Gould, & Lovelace, 1989; Jankovic, 1994; Aronson, McCaffrey, Litchy, & Lipton, 1993; Pasricha, Ravich & Kabo, 1993; Grillone, Blitzer, Brin, Annino, & Saint-Hilaire 1994). The drug acts to produce a neuromuscular paralysis through binding with acetylcholine receptors on the motor end-plate of the neuromuscular junction, and may serve to interfere with acetycholine release from presynaptic membranes (Sellin, 1981).

Dunne, Hayes and Cameron (1993) reported therapeutic usage of BOTOX on a patient whose primary basis for dysphagia was cricopharyngeal dystonia. Using electromyographic (EMG) guidance, the BOTOX was injected into the cricopharyngeus, in two sites, under videofluroscopic control. Videofluoroscopic re-evaluation two weeks after the injections revealed marked improvement and confirmed the patient's report of return of function. Schneider, Thumfart, Pototschnig and Eckel (1994) reported use of botulinum toxin rather than myotomy to treat cricopharyngeal dysfunction in a series of seven patients with severe dysphagia. In this relatively non-invasive method, a specially designed rigid esophagoscope was used to gain access to and visualize the cricopharyngeus. Following electromyographic confirmation of identification of the muscle, a tuberculin syringe (placed via a butterfly cannula) was used to administer the BOTOX into three injection sites. Within two weeks post-injection, all but two of these patients reported complete relief or substantial improvement in swallowing function. As with other therapeutic applications of BOTOX, the effect was temporary; these authors reported that the maximum duration of benefit for these patients was five months.

CASE REPORT

Patient Background

JM, a 73 year old white male, suffered a brainstem stroke on June 6, 1994, which left him with residual bilateral paresis (right greater than left), dysmetria, dysarthria, dysphonia, and severe dysphagia. The patient was admitted to a local hospital, subsequently developed aspiration pnuemonia, and on June 17, 1994, underwent insertion of a percutaneous endoscopic gastrostomy (PEG) The patient's feeding status was NPO with all nutrition, hydration, and medication administered via PEG tube. Suction was used for oral secretions on a continuous basis. JM's medical history included multiple cerebrovascular accidents (1991; 1993), hypertension, coronary artery disease with angina, paroxysmal atrial fibrillation, hiatal hernia with multiple failed repairs, atherosclerotic heart disease, and chronic gastroesophageal reflux.

The patient was transferred to the Physical Medicine and Rehabilitation Ward of the Department of Veterans Affairs Medical Center at Bay Pines, Florida, July 6, 1994, and was promptly referred to the Speech Pathology Section for evaluation and management of dysarthria and dysphagia. Clinical observations at bedside included shortness of breath, severe diplophonia and upward pitch breaks, persistent, harsh throat-clearing and coughing; and reduced laryngeal elevation during voltional swallow. The patient was unable to swallow trial feedings of small bolus amounts of varied consistencies and textures, and regurgitated everything presented by mouth. JM also complained of loss of sleep, due to choking episodes, which caused him to awaken throughout the night to suction himself.

Videofluoroscopic evaluation of swallowing (modifed barium swallow) was performed on July 19, 1994. The study indicated that while the oral stage of JM's swallow was unremarkable, the pharyngeal stage was characterized by severe general stasis of bolus material during and after the swallow for all consistencies and amounts presented. Laryngeal elevation was markedly reduced, with only a trace amount of bolus material traversing the upper esophageal sphincter and entering the esophagus. The pharyngeal stasis appeared to evoke a coughing, throat-clearing maneuver which resulted in regurgitation of the material from the pharynx. Laryngeal penetration of pharyngeal residue during presentation of thick liquids was noted. The patient was judged to be at high risk for aspiration.

JM was enrolled in a daily swallowing stimulation therapy group. Treatment involved direct and indirect approaches (Logemann, 1983). Direct therapy consisted of presentation of small amounts of crushed, lemon-flavored ice (<1 teaspoon introduced at a time), and reinforcing implementation of additional or subsequent swallows to assist in transport of the bolus through the upper esophageal sphincter. During this procedure, the patient was encouraged to cough and swallow as needed to clear his airway, and to sustain "ah" briefly at various intervals as a means of monitoring his voice for a "wet" or "gurgly" quality. Presence of a wet/gurgly vocal quality served an indicator for the need for additional cough-swallows. Indirect therapy consisted of exercises aimed at facilitating improved respiratory drive, coordination and support, and increasing extent and duration of vocal fold approximation.

After 9 weeks of therapy, JM had achieved the recommended criterion for each of the tasks and exercises utilized during treatment sessions. Follow-up fiberoptic endoscopic examination of swallowing (FEES) (Langmore, Schatz, & Olsen, 1988) showed persistent general pharyngeal stasis of bolus material after the swallow, especially in the pyriform sinuses. The patient was able to attain adequate pharyngeal constriction to expectorate most of the materials presented. It was inferred that persistent cricopharyngeal hypertonicity was the major factor contributing to JM's dysphagia. He continued to receive nutrition and hydration via PEG despite greatly improved performance in related tasks in the therapy regimen.

Several factors were considered which might have contributed significantly to the dysfunction of the upper esophageal sphincter. First, the nature and severity of JM's stroke would appear to indicate some neurogenic contribution to the cricopharyngeal dysfunction. Second, JM had a history of chronic gastroesophageal reflux disease (GERD). Dysphonia, failed hiatal hernia repair, as well as complaint of stomach acids "coming back up" on him, appeared to be clinical indicators that the GERD may have been severe enough to result in scarring of esophageal tissue. Scarring may serve to function as a mechanical basis for seeming inability of the upper esophageal sphincter to relax sufficiently during swallowing to permit functional deglutition (Ravich, 1992). The patient was referred to gastroenterology for esophagoscopy to rule out scarring of cricopharyngeall esophageal mucosa secondary to GERD. The findings were negative. JM was then referred to the Ear, Nose and Throat (ENT) clinic for discussion of other management options. Initially, it was suggested that the patient continue in swallow stimulation therapy for an additional period of time. However, JM had not been able to get adequate sleep as a result of the nature of his dysphagia, and had been NPO since June. He indicated a preference for a more immediate solution. Cricopharyngeal myotomy was discussed. Unfortunately, JM's history of gastroesophageal reflux, and the clinical impression that GERD was a recurrent problem, did not enhance his candidacy for such surgical intervention. This was especially the case given the irreversibility of myotomy. Weakening the sphincter, via BOTOX injection, seemed a viable alternative which would address the effects of the cricopharyngeal hypertonicity, yet offer the possibility of eventual return of remaining function should the gastroeophageal reflux present even greater problems in the future.

Initial Procedures

Several issues needed to be addressed including (a) access to the upper esophageal sphincter, (b) identification of the cricopharyngeus m. itself, (c) selection of injection site(s), and (d) the injection volume of BOTOX to administer. It was decided that surgical exposure for the initial trial presented the most efficacious means of access to, and identification of, the cricopharyngeus m., regardless of injection site(s) chosen. Deriving the dosage to be administered posed a significant dilemma: inject too little, and the sphincter would not be weakened sufficiently to overcome the hypertonicity or achalasia. Overdosage might affect other, less involved muscles of swallowing, such as the pharyngeal constrictors, as a result of diffusion to contiguous musculature. The quantity to administer was ultimately determined based upon quantities clinically known to the Neurology section to be satisfactory for other sphincteric com-

plexes, such as orbicularis oculi. It appeared that 15 units in a single posterior hemisphere site and 15 units in a single anterior hemisphere site (.15 ml at 10 unit strength/.1 ml) would be adequate to achieve the desired outcome.

On September 30, in consult with the head and neck surgeon, JM was counseled as to the risks involved in the procedure as proposed. He was informed and understood that the full effect of the procedure could not be determined until after it was performed. The patient was extremely anxious to undergo the procedure. Surgery was scheduled for October 3, 1994.

The surgical technique in this case was identical to that used for cricopharyngeal myotomy (Baredes, 1988) with the exception that the fibers of the cricopharyngeus were not ultimately transected. Rather, botulinum toxin was injected via syringe directly into the anterior and posterior hemispheres of the sphincter in the dosages and unit strengths described above. The procedure was completed without complication.

INITIAL OUTCOME

Ten days after surgery, JM began trial intake of semisolid foods by mouth. Initially, symptoms of gastroesophageal reflux disease had worsened, but were brought under control with pharmacologic management including use of H_2 blockers and proton pump inhibitors. Videofluoroscopic re-examination of swallowing showed minute laryngeal penetration with trace aspiration of thin and thick liquids during the swallow, but JM was able to safely swallow semisolid consistencies. Propulsion and transport of bolus material was markedly improved. He effectively employed subsequent dry swallows to clear minor residual static semisolid material from pharyngeal recesses. JM continued in therapy with tasks and exercises aimed at improving sustained adduction of the vocal folds to facilitate improved laryngeal closure during swallowing. Re-evaluation by FEES in January of 1995 indicated further improvement in function, and JM's diet was advanced to mechanical soft consistencies with thickened liquids. Approximately one month later, repeat evaluation by FEES resulted in a full upgrade to a regular diet, including thin liquids. By mid-February, however, JM began to complain of a return of symptoms of increasing difficulty swallowing, and that it was harder to "get food down". As his dysphagia gradually worsened, it was apparent that the temporary beneficial effects of the BOTOX were diminishing, and a subsequent treatment (perhaps treatments) would be necessary.

SUBSEQUENT PROCEDURE

It was acknowledged that a less invasive procedure was needed for repeat administration of BOTOX as would eventually be required by JM. A technique was devised that utilized a combination of Dedo-microlaryngoscopy, electromyographic identification of the cricopharyngeus m., and fiberscopic delivery of BOTOX via an injection catheter. The procedure was to be performed in a specially equipped EMG suite with an ENT physician, neurologist, and two speech pathologists.

The patient was administered approximately 10 cc of 2% viscous lidocaine orally and asked to swallow it. The Dedo-microlaryngoscope was placed and used to gain working access to the pharynx and open the upper esophageal sphincter so that it could be visualized. EMG confirmation of visual identification of cricopharyngeal muscle fibers was performed using a needle electrode. Observations of a decrement in muscle activity observed mid-swallow would be used to infer appropriate electrode placement in cricopharyngeal muscle fibers. After location and confirmation of desired injection sites in this manner, the microlaryngoscope was removed.

A 25 gauge Variject flexible catheter (Microvasive Boston Scientific Corp., Watertown MA) injection therapy needle, with a 1.8 mm outside diameter and 200 cm length was prefilled with 1.2 mm of saline and placed into the working channel of a rigid Olympus LTF endoscope with flexible tip (Olympus Corp., Lake Success, NY) which has a working length of 300 mm and an outside diameter of 9.3 mm. The injection catheter was placed so that, with the tip retracted, the end of the needle was flush with the tip of the endoscope. A luer-lock syringe was then filled with BOTOX reconstituted at a strength of 10 units per 0.1 ml, and attached to the needle hub of the injection catheter. The endoscope thus readied was passed orally to the level of the cricopharyngeus. The needle was then extended approximately 5 mm beyond the tip by pushing a circular finger grip into the working end of the catheter hub. Then the extended needle was positioned so that the injection site was visibly verified. The endoscopist then pressed the tip of the scope against the injection site so that the extended needle was inserted. The injection was delivered so that first saline, then BOTOX, were administered to the dorsomedial and anterior aspects of the upper esophageal sphincter, using .5 ml per injection site (50 units per site) for a total of 100 units. Following each injection, 1.2 ml of saline via a second syringe was alternated with BOTOX syringe to fully pass the BOTOX through the length of the catheter and into the injection site. This method of administration, devised by the attending Neurologist, was deemed necessary since the length of the injection catheter precluded it being loaded solely with the BOTOX.

SUBSEQUENT OUTCOME

Within one week following the procedure, JM reported an increased ease of being "able to get food down." Management of oral secretions, including viscosity, was observed to gradually improve as well. Over the course of the next two weeks, JM noticed further improvement in swallowing function, and was returned to a regular diet (geriatric with liquids). The beneficial effect of this application of BOTOX, as evidenced by improved swallow function, appeared to begin to diminish at approximately eight weeks. It was anticipated initially that the duration of benefits enjoyed would be of a significantly longer period of time- from 3 to 4 months.

DISCUSSION

Dysphagia resulting from dysfunction of the upper esophageal sphincter (cricopharyngeus m.) secondary to brainstem infarct has frequently been reported. The usual intervention for cricopharyngeal achalasia is myotomy. Botulinum toxin (BOTOX) is increasingly being used to treat focal dystonia. An application of BOTOX as an alternative to myotomy and "litmus test" for the ultimate transection of muscle fibers in a case of dysphagia resulting from cricopharyngeal dysfunction has been described. From a successful initial surgical trial, a less invasive clinical method was derived utilizing endoscopic delivery of BOTOX to the affected muscle. The patient in this case experienced com-

plete relief from dysphagic symptoms shortly after undergoing the procedure, and was advanced from NPO to regular (geriatric) diet with liquids. However, the overall duration of the benefit of the return to regular diet was eight-to-ten weeks shorter for the endoscopic method than for the surgical technique.

Duration of Desired Effect

A number of extraneous variables, singularly or in some combination, may have influenced the less than satisfactory outcome relative to the duration of effect of the second administration of BOTOX. First, it was possible that since the injection site by endoscopy was slightly different than the site injected directly during surgery, a different effect on function should have been expected. Second, the method of injection by endoscopy might have permitted some of the BOTOX to leak from the injection site. Since the view was obscured during the actual injecting, it could not be verified that all of the solution was injected into the site selected. Therefore, the actual dose administered might have been less than intended for these purposes. Finally, use of saline to fill the injection catheter in order to conserve BOTOX, and "chasing" the first BOTOX dosage with additional saline to prepare for the next injection, may have diluted the preparation and resulted in less unit strength per volume. Saline (preservative free) was also used as a diluent in the reconstitution of the BOTOX.

Varying the site of injection was ruled out as a major contributing factor in the reduction in the duration of desired effect, on the basis that the degree of satisfaction reported by JM in swallowing function obtained via the endoscopic procedure was improved from that obtained during surgery. The possibility that loss of BOTOX during injection from leakage was also discounted because the visual image of tissue immediately following injection gave no indication that the injection was anything other than effective relative to the delivery of the desired agent. Ultimately, it appeared to be the case that the introduction of additional saline into the injection catheter and ultimately the injection site, resulted in dilution of the agent and a subsequent reduction in the duration of its effect.

A future refinement in the technique of endoscopic delivery of BOTOX to the cricopharyngeus must therefore address the issue of the length of the injection catheter (200 cm) and the quantity of agent required to prime and fill its length prior to injection. Since Botulinum Toxin A is typically available in 100 units/vial (Allergan Pharmaceuticals, Irvine, CA) use of a shorter injection catheter which requires a minimal amount of BOTOX (less than .5 ml) would permit the use of reconstituted BOTOX to prime the catheter and to be administered to the desired location, without introducing additional diluent(s) into the injection site.

Comparison of Surgical Exposure and Injection vs. Endoscopic Injection Technique

The surgical technique of exposing and then directly injecting the cricopharyngeus m. had several advantages over the endoscopic method. First, the surgical exposure of the cricopharyngeus m. was precise. The head and neck surgeon was highly skilled and experienced; he had performed literally hundreds of cricopharyngeal myotomies. The muscle fibers in question were readily identified. Second, the injection of BOTOX into the exposed cricopharyngeus via syringe was direct, and therefore accurate. As a result, the duration of desired effect of the toxin was greater than that achieved via endoscopy with the additional diluent required for the 200 cm injection catheter. Finally, surgery did not cause any immediate discomfort for the patient, who indicated that he found the initial insertion and placement of the dedomicrolaryngoscope in the oral and pharyngeal cavities somewhat distressing.

The advantages of the surgical method were far outweighed by the disadvantages and risks typical of many invasive procedures. Risks associated with (a) use of general anesthesia, (b) damage to the recurrent laryngeal n., and (c) duration of recuperation period, are all avoided with the endoscopic technique. In addition, endoscopy can be performed on an outpatient basis, whereas JM was hospitalized for the course of his post-surgical recovery. Resource and manpower allocation for the endoscopic method are therefore considerably less intensive than for surgery.

Advantages of the endoscopic method included (a) the short time needed to perform the procedure, (b) videotape capability with a closed-circuit camera coupled to the endoscope, (c) ease of maneuverability to different possible injection sites, (d) application of only topical anesthetic and (e) bypassing other risks associated with surgical procedures. Disadvantages included (a) use of additional diluent with the BOTOX following injection, (b) some transient discomfort experienced by the patient during the procedure, and (c) need for EMG confirmation of muscle group identification. It is hoped that repeat applications of BOTOX may be accomplished using video identification of injection sites. Methods of obtaining or devising shorter catheters are currently being explored for future applications of the endoscopic injection method.

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CASPER: Computer Assisted SPeech Evaluation & Rehabilitation System

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Abstract

Existing computer technologies and laboratory knowledge are seldom used routinely for diagnostic speech evaluation. There are no universally accepted standard tasks or measures for the evaluation of speech. Speech evaluation methods can vary markedly among clinics and rely heavily on subjective impressions. This paper describes an integrated hardware/software system that has been developed to assist in professional evaluation of disordered speech and related physiology in Children and Adults. It has been disseminated to more than 35 VA and private-sector clinics.

INTRODUCTION

Individuals seek professional evaluation of speech because they have difficulty being understood, sound unnatural, or both. More specific deficits in production of voice, nasal resonance, prosody, and speech sounds underlie general complaints about intelligibility and naturalness. Diagnostic evaluation requires measurement of these aspects of speech and investigation of physiological subsystems logically implicated by the speech signs and symptoms. The system described in this paper, CASPER (Computer Assisted SPeech Evaluation & Rehabilitation), is an integrated hardware\software system developed to assist in professional evaluation of speech and speech-related physiological functions. It uses a microphone and other specialized instruments to sample the speech signal and test related physiological functions. Four of CASPER's 11 protocols provide measures related to voice, prosody and nasal resonance. Depending on the nature of the observed speech deviance, additional protocols are recommended to assess the physiological integrity of the pulmonary, laryngeal, velopharyngeal, and upper airway articulatory system. A user specified protocol allows custom tasks to be created and analyzed using 1-4 channels of input.

SYSTEM DESCRIPTION

CASPER requires a 486 DOS-compatible PC and an A/D card that supports collecting 1-4 channels of data. Transducers include microphone, dual channel aerodynamic system, electroglottograph, and accelerometer. Additional signal conditioning hardware is desirable for scaling and filtering.

Protocol Organization. CASPER is composed of 10 pre-assembled instrumental protocols and a User Input Protocol (UIP) which allows the user to record perceptual judgements of specific speech dimensions. Table I provides features of the CASPER protocols. Many of the calibration, data collection, display, analysis, and reporting tasks have been automated in the pre-assembled protocols. The protocols using microphone input alone sample nonsegmental aspects of speech. Protocol P1 provides measures of average speaking SPL, fundamental frequency and their variability as well as estimated speaking rates, pausing rates, and syllable durations. Specific measurements of contrastive syllable stress and intonation are possible follow-up measures (P3,P4). For voice disordered patients, automated measurement of frequency perturbation (jitter), amplitude perturbation (shimmer), and harmonic-to-noise ratio can be made (P2). Other protocols allow investigations of pulmonary (P7,P8,PIO), laryngeal (P5,P8), or velopharyngeal (P6,P9) function that may underlie the observed speech deviance. The User Specified Protocol (P 10) is a general purpose protocol that allows the user to collect, analyze, and report data for a variety of custom-defined clinical tasks.

TABLE 1. Current CASPER Protocols

	PROTOCOL NAME & TRANSDUCERS	SAMPLE LENGTH	MEASURE CLASS	MEASURES REPORTED (n)
P0	User Input (UIP)	NA	Ratings of Selected Speech dimensions	14
P1	Acoustic Monologue Mic Only	30 s	Fo, SPL,Syllabic rate, Pausing	17
P2	Prolonged /a/ Mic Only	0.5 s	Fo, Jitter, Shimmer, HTN	5
P3	Syllabic Stress Mic Only	2 s	Fo, SPL, Duration Ratios	12
P4	Intonation Mic Only	2 s	Fo Ratios	4
P5	Electroglottography Mic & EGG	0.5 s	Open, Close, Speed Quotient	8
P6	Accelerometry Mic & Accelerometer	3 5	HONC, Accelerometric Difference Index	4
P7	Aerodynamic Monologue Mic & Pneumotachographic Mask	60 s	Inspiratory, Expiratory, & Pause Aerodynamics	18
P8	Vocal Tract Resistance Mic, Pressure, Pneumotach Msk	5 5	Oral Pressure, Airflow, Resistance & Efficiency	10
P9	VP Aerodynamics Mic, Pressure, Nasal Pneumotach & Msk	5 5	Oral Pressure, Nasal Flow Nasal and VP Resistance	31
P10	(USP)User Specified Protocol	.01-60 s	1-4 Ctl; .1-40 kHz; 120 k points; Up to 4 Transducers. Custom Analyses.	

CASPER PROTOCOL STANDARD FEATURES

The patient's name and demographic information are entered by the user and stored with the acquired signals. The user may elect to record perceptual judgements of speech dimensions in the UIP. If UIP data are present, CASPER can advise the user regarding appropriate instrumental tests depending on the nature of the speech deviance recorded. Alternatively, the user may select from among the instrumental protocols.

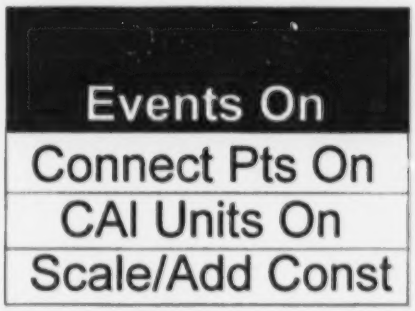
Task & Data Collection. Help screens provide information regarding subject instruction, transducer connections and calibration requirements. Five unique calibration 'setups" may be stored~ recalled, and edited for each protocol allowing for a variety of clinical and research activities. On-line sampling of calibration reference signals is supported to create each specific "set-up" or to record the unique run-time conditions. After the subject has performed the task, the digitized signal is displayed for visual verification by the user The program warns the user if out-of-range data are present.

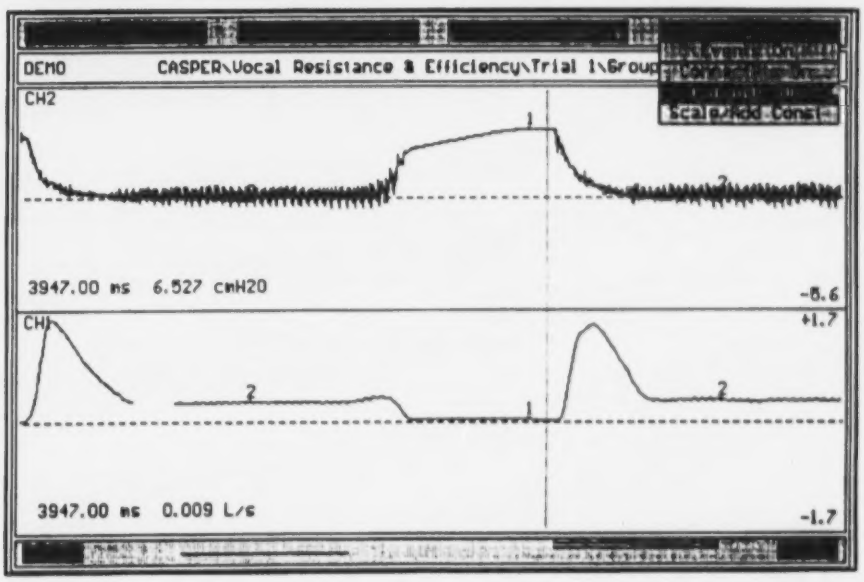
Analyses & Reports. Automated analyses may be requested after each protocol or performed at a later time. Valid quantitative results rely on accurate marking of landmarks on the time-domain signal. Much effort has been directed toward making CASPER algorithms robust for accurately marking signal landmarks. However, for difficult to test patients, there is full support for review and manual editing of event marks. Figure 1 shows the algorithm generated landmarks for air pressure peak (#1 in upper panel) and midvocalic airflow (#2 in lower panel) during a sequence of /pi/ syllables. Analyses is accomplished in a few seconds. Note the calibrated cursor readout of pressure and flow reported in each panel. Quantitative results may be reported with- or without automated comparison to stored expected values (Table 2). Users may edit normative values or produce their own using data base features.

Data Base Summaries. CASPER user can name 12 clinical or research group codes at the time of installation. Subject results are stored in a data base which allows production of group summary statistics for various categories of group, gender, and age. If the group is a local normative group, the data can be stored as expected values for comparison with patient measures.

CASPER CUSTOM DISPLAY & ANALYSES FEATURES

Custom analyses for user-defined tasks can be performed with a variety of built-in tools. Visual displays can be manipulated as shown in the menu below. The options menu allows events to be shown, single datum point display, calibrated cursor read out, and digital amplification, attenuation, offset adjustment, and demeaning.





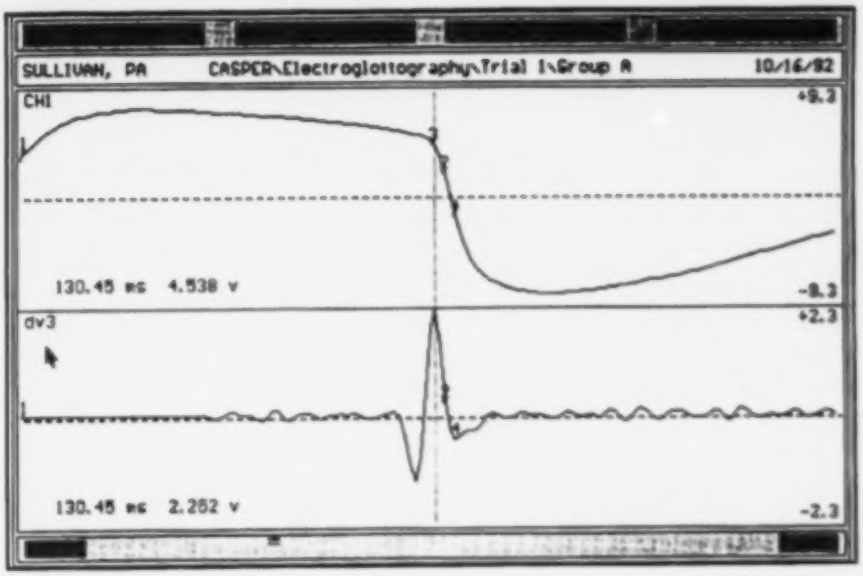
Statistical characteristics between user-defined onset and offset points include maxima, minima, mean, SD, RMS, duration, and time integral. These may be requested in raw voltages or caiibrated units. For example, the time integral feature will allow rapid integration of airflow signals to yield volumes for syllables or syllable segments.

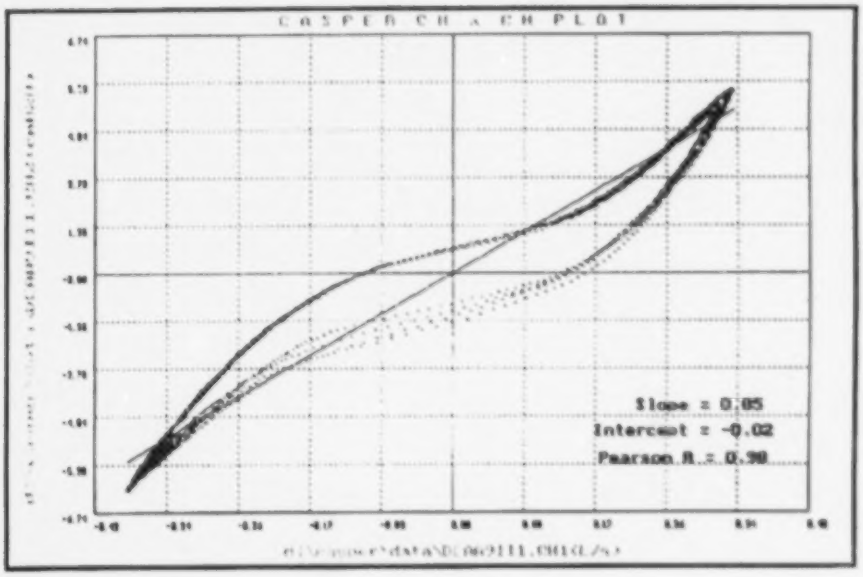
Another set of processing functions allows the user to create, display, and measure a continuous function derived from the original signal. RMS amplitude contours, FO contours, derivatives, and continuous time integrals may be displayed

Table 2. Sample quantitative results and automated comparison with expected values for P8

	MEASURE	OBSERVED	EXPECTED	LO - HI LIMIT	FINDING
Oral Pressure	3.93 (CmH2O)	5.94	3.9	8.0	L
Airflow	124.24 (Ml/s)	145	85	205	
Resistance	31.69 (cmH2O/L/s)	35.7	24.5	56.9	
SPL	81.07 (dB)	79.6	75.5	83.7	
Efficiency (x 10^5)	1.31	2.41	1.03	3.79	

The figure on the right shows a 3rd derivative function (lower panel) calculated from the electroglottographic signal (upper panel). Note how the peak in the function corresponds with onset of the glottal closing gesture. The Figure below illustrates the X-Y plotting capabilities. The function depicted illustrates nasal airflow plotted against nasal-pharyngeal air pressure during nasal inspiratory/expiratory cycles. Future enhancements will include digital filtering, FFT display, and wave form feature detectors.





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Practice Parameters: What Are They And How Will They Affect Health Care Practice?

Paul Watson Lambert, J.D.

ABSTRACT

Practice parameters define clinical indications, methods of treatment, and outcomes based upon a profession's clinical consensus. An overview of practice parameters, their development and use, is described.

INTRODUCTION

The concept of practice parameters is not new. Practice parameters came into required acceptance by the health care community upon passage of the Omnibus Budget Reconciliation Act of 1989, Public Law 101-239 (1993) and subsequent state laws which required adoption of practice parameters for each health care discipline. The Omnibus Reconciliation Act of 1989 established the Agency for Health Care Policy and Research (AHCPR). Within this agency was created the Forum for Quality and Effectiveness in Health Care (Forum). The purpose of the Forum was to arrange for the development, periodic review, and updating of guidelines for clinical practice. These guidelines or parameters of practice were to be used by health care practitioners and educators to determine how specific conditions could most effectively and appropriately be prevented, diagnosed, treated, and managed.

Practice parameters and their revisions are based on measured outcomes. However, the first draft of practice parameters for any discipline usually does not have outcomes upon which to base measured guidelines. Therefore, the first draft of practice parameters provides the starting point for measuring outcomes and will show that some treatment approaches work and some do not.

A key to valid practice parameters is consensus amongst a profession as to what works. That concensus should not be based on what we wish the practice to be, but it should be based on what outcomes and research show are valid and effective. An open mind is needed to assess outcome results. The outcomes may shatter some established beliefs and enforce other unconventional beliefs.

FLORIDA'S REQUIREMENT FOR ADOPTION OF PRACTICE PARAMETERS

The Health Care Reform Act of 1992 and the Health Care Reform Act of 1993 require the adoption of practice parameters or practice guidelines for each health care discipline by the Agency for Health Care Administration. These practice parameters are to be based upon scientifically sound professional practice. Each respective health care discipline "practices" to eliminate unwarranted variations in the delivery of health care. Practice parameters define appropriate clinical indications, methods of treatment, and outcomes. They should be based upon a broad national consensus to be academically and clinically valid.

Practice parameters are not intended to serve as cookbooks for the practice of medicine.[1] Practice parameters are intended to guide the practices of health care. Variations from practice parameters are appropriate where demonstrated by patient records. The Health Care Reform Act authorizes "warranted variations" buts intends to "eliminate unwarranted variations in the delivery of health care."

Practice parameters are addressed in the Health Care Reform Act in Subsections 408.02, Florida Statutes (1993) as amended by Section 36, Chapter 93-129, Laws of Florida. Subsections 4408.02(1)-(7) & (10) are relevant to this discussion and are cited here:

408.02 PRACTICE PARAMETERS

(1) The Agency for Health Care Administration shall coordinate the development, endorsement, implementation, and evaluation of scientifically sound, clinically relevant practice parameters in order to reduce unwarranted variation in the delivery of medical treatment, improve the quality of medical care, and promote the appropriate utilization of health care services. "Practice parameters" or "practice guidelines" are defined to mean strategies for patient management that are developed to assist physicians and clinical decision-making.

(2) The agency shall establish a workgroup of appropriate medical and technical professionals and agency personnel to develop uniform standards and methods for the collection and analysis of patient outcomes data. The workgroup shall focus on collecting data which measures both the efficient utilization of medical resources and the effectiveness of medical care, and shall include such factors as patient diagnosis, the severity of the patient's condition, patient length of stay, number of diagnostic tests and scans performed, procedures

performed, medications prescribed, number of consultations, patient mortality, source and date of patient admission and readmission, total patient charges and source of payment, and patient discharge status. The workgroup shall seek to coordinate data collection with the data committee created pursuant to s. 408.7025. The workgroup shall have completed the development of such standards by December 31, 1993.

(4) The agency shall summarize the effectiveness and cost of care outcomes for each diagnosis by hospital, by district, by region, and across the state, as well as by any other grouping which will facilitate the development of clinically relevant practice parameters. The agency shall make the report available to the public and all hospitals throughout the state on an annual basis beginning December 31, 1994. The agency shall also make data submitted pursuant to subsection (3) available for analysis by others, subject to protection of confidentiality pursuant to s. 408.05(6).

(5) The agency, in conjunction with the Florida Medical Association, the Florida Chiropractic Association, the Florida Osteopathic Medical Association, the Florida Podiatric Medical Association, and other health professional associations, and in conjunction with the respective boards within the Division of Medical Quality Assurance, shall develop and may adopt by rule state practice parameters based on the data received under subsection (4) as well as on nationally developed practice guidelines. However, practice parameters adopted by rule shall not provide grounds for any administrative action. The agency shall prioritize the development of those practice parameters which involve the greatest utilization of resources either because they are the most costly or because they are the most frequently performed. Prior to the development of practice parameters under this subsection, the agency in conjunction with the various health professional associations may proceed with the development of stste practice parameters based on nationally developed practice guidelines.

(6) The agency, in conjunction with the appropriate health professional associations shall develop and adopt by rule practice parameters for services provided by diagnostic imaging centers, radiation therapy services, and comprehensive rehabilitative services. Practice parameters applicable to diagnostic imaging services shall be developed by December 31, 1993.

(7) Parameters developed pursuant to this section shall be made available to the public and to all hospitals and health professionals throughout the state.

(8) Procedures shall be instituted which provide for the periodic review and revision of practice parameters based on the latest outcomes data, research findings, technological advancements, and clinical experiences, at least once every 3 years.

(10) The agency shall include a progress report on the development of practice parameters in the final Florida Health Care Plan submitted to the Legislature by December 31, 1993. The report shall address the data collection, the development of state practice parameters, and the utilization of practice parameters by hospitals and health professionals.

As is stated in Subsection 408.02(1), practice parameters are to be scientifically sound and clinically relevant in order to reduce unwarranted variation in the delivery of medical treatment, improve the quality of medical care, and **promote the appropriate utilization of health care services**. "Practice parameters" or "practice guidelines" are defined as strategies for patient management that are developed to assist physicians and other health care professionals for clinical decision-making.

Accordingly, practice parameters will serve to educate the public, physicians, other health care providers and third party payors as to the best utilization of the various health care disciplinary approaches. Since physicians are the portal of health care delivery, practice parameters will provide them with guidelines for utilizing particular health care approaches for optimum patient management. Therefore, health care practitioners should prepare to educate physicians on the use and understanding of the practice parameters for their respective disciplines and demonstrate how to utilize their particular health care discipline for optimum patient treatment outcome.

Subsection 408.02(4), Florida Statutes (1993), requires the Agency for Health Care Administration to summarize the effectiveness and cost of care outcomes for each diagnosis by hospital, by district, by region, and across the state as well as by any other grouping which will facilitate the deveolpment of clinically relevant practice parameters. The agency shall make the report available to the public and all hospitals throughout the state on an annual basis. This means that data on the effectiveness and cost of each health care disciplinary approach will be measured, published and widely distributed. This provides the opportunity to show the effectiveness and cost efficiency of the various health care delivery approaches.

Subsection 408.02(8) recognizes that valid practice parameters are dynamic by requiring procedures to be instituted which provide for the periodic review and revision of practice parameters based on the latest outcomes data, research findings, technological advancements, and clinical experiences, at least once every three years. Therefore, just as the practice of any health care discipline is not static and changes as the science of health care delivery grows, so should practice parameters change to reflect that growth.

The validity of practice parameters depends upon a process of continuing review to identify changes and new developments in health care science. Those changes need to be reflected in practice parameters to maintain an accurate concensus of the science of one's profession as applied through the art of one's profession. And, practice parameters cannot be validly developed without the consenus process.

PRACTICE PARAMETER DEVELOPMENT

Practice parameters or clinical guidelines are systematically developed statements to assist health care practitioners and patients in decisions about appropriate health care for specific clinical circumstances. The AHCPR Program en-

titled **Clinical Practice Guideline Development** (1993) suggests the content and steps for establishing practice parameters or clinical guidelines. Several relevant definitions are listed below.

Clinical Practice Guidelines- systematically developed statements to assist in health care decision-making

Medical Review Criteria- systematically developed statements that can be used to assess the appropriateness of specific health care decisions, services, and outcomes

Standards of Quality- authoritative statements of (1) minimum levels of acceptable performance or results, (2) excellent levels of performance or results, or (3) the range of acceptable performance or results

Performance Measures- methods or instruments to estimate or monitor the extent to which the actions of a health care provider conform to practice guidelines, medical review criteria, or standards of quality.

GUIDELINE ATTRIBUTES

The following attributes (and explanatory statements) are applicable to both the development of new guidelines and the evaluation of existing ones. These attributes include:

Validity: Practice guidelines are valid if, when followed, they lead to the health care and cost outcomes projected for them, other things being equal. A prospective assessment of validity will consider the projected health care outcomes and costs of alternative courses of action, the relationship between the evidence and recommendations, the substance and quality of the scientific and clinical evidence cited, and the means used to evaluate the evidence.

Reliability/Reproductibility: Practice parameters are reliable and reproducible if a separate set of drafters would produce essentially the same statements given the same evidence and methods for development and given the same circumstances. A prospective assessment of reliability may consider the results of independent external review and pretests of the guidelines.

Clinical Applicability: Practice parameters should be as inclusive of appropriately defined patient populations as scientific and clinical evidence, and expert judgment permit and they should explicitly state the populations to which statements apply.

Clinical Flexibility: Practice parameters should identify the specifically known or generally expected exceptions to their recommendations.

Clarity: Unambiguous language should be used in drafting practice parameters with terms precisely defined and the use of logical easily followed modes of presentation.

Multi-Disciplinary Process: Representatives of key affected groups should participate in practice parameters development providing evidence and view points to the developing panels of drafters.

Scheduled Review: Essential to practice parameters validity is periodic, scheduled review to determine whether revisions are warranted, given new clinical information or evidence for changing professional consensus.

Documentation: Meticulous documentation and description of the process followed by the developing panels, with notations of assumptions and rationales accepted, evidence used, and the analytic methods employed is essential to developing confidence in the practice parameters.

METHODOLOGY

The AHCPR points out in its program notes that the purpose of clinical practice guidelines is to enhance the quality, appropriateness, and effectiveness of health care. All scientific evidence must be considered, the consequence of different options must be weighed, and the scientific evidence and subjective judgments supporting the chosen options described explicitly. The methodology emphasizes the importance of a comprehensive evaluation of empirical evidence of effectiveness, significant outcomes (including those important to patients), benefits, and harms. Explicit documentation to methods, rationales, and assumptions is required.

Professional judgment and group consensus are appropriate to be used in the absence of documented scientific and empirical evidence on a particular aspect of a condition. The lack of evidence and use of expert opinion are recorded to document how decisions were made in developing a particular practice parameter. Such identification of areas of insufficient evidence provides guidance in critiquing the effectiveness of the practice parameter.

STEPS FOR PRACTICE PARAMETER DEVELOPMENT

The following steps are suggested for developing practice parameters:

- Clearly define major questions regarding clinical conditions to be addressed.

- Review and analyze available scientific research for each question.

- Assess clinical benefits and harms of each intervention.

- Review estimates of important patient outcomes for each intervention being considered.

- Review current and potential health care costs associated with particular practice parameters and, where cost information is available and reliable, provide costs for alternative strategies for the prevention, diagnosis, treatment, and management of particular conditions

- Invite information and comments on guideline topics from professional and consumer organizations, researchers, manufacturers, and others. Conduct open meetings to hear public comments on issues relevant to clinical conditions addresed by the practice parameters.

- Prepare a practice parameter based upon the available evidence and professional judgment where empirical evidence is insufficient.

- Submit the draft of the proposed practice parameters to peer review and pilot review, when practical, in actual use by clinicians and other experts.

- Revise the draft proposal based upon the analysis of comments and information received.

DISTRIBUTION

It is essential to have as wide a distribution of practice parameters as is possible. It is incumbent upon the developers of practice parameters to make them available to all practitioners or people affected by them. Wide distribution will provide the opportunity to address them, follow them, and give feedback for results. The "practice parameters process" is an opportunity to demonstrate the effectiveness of any health care discipline.

CONCLUSION

The health care delivery system is evolving into its next phase of approach and application. Commonly accepted approaches are no longer accepted at face value. Effectiveness of approaches based upon empirical measurements of their outcomes will cause reevaluation of old ideas and the development of new ideas. Outcomes measurements will show that some established simple ideas and approaches which have not heretofore been empirically measured, work the best. Some new "trendy" approaches may be shown to be effective or ineffective. Only through accepted record keeping and notations developed through a consensus process can reliable, valid measurement of treatment approaches be developed. Practice parameters will provide a consensus methodology to approach health care delivery on a scientific and empirical basis allowing the science and art of one's profession to be more effectively practiced.

FOOTNOTE 1

"Medicine" in this context is used in its generic sense meaning the practice of health care delivery by all health care practitioners. In its parochial use, the term "medicine" typically is used to mean "allopathic medicine" or "osteopathic medicine" or "chiropractic medicine" or "podiatric medicine" throughout the Florida Statutes. However, as recognized by the courts, "medicine" means the universe of health care delivery. See *Horowitz v. American Motorist Ins Co.*, 343 So.2d 1305 (Fla. 2nd DCA 1977).

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Voice Therapy For Patients With Parkinson's Disease

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ABSTRACT

Parkinson's disease (Pd) is a progressive neuromuscular disease that can have physiological effects on the laryngeal mechanism. A voice treatment program focusing on the laryngeal pathophysiology of Pd is described.

INTRODUCTION

It is the philosophy of this author that voice therapy for patients with Parkinson's disease should not be attempted without a basic understanding its pathophysiology. A short and intensive voice treatment program based mainly on the physiological effects of Parkinson's disease (Pd) on the laryngeal mechanism is described. A clearer perception of the whole patient, as well as obstacles faced in day-to-day communication, can be gained by an understanding of the etiology, medical management and associated problems of Pd.

Etiology

Parkinson's disease is a progressive, degenerative nervous system disease caused by the loss of certain nerve cells located within the substantia nigra. These cells produce the chemical dopamine. Dopamine is a neurotransmitter. Dopamin-producing cells within the extrapyramidal system are responsible for *preventing* involuntary movements as well as organizing and controlling complicated movements. Loss of dopaminergic neurons is the *key underlying feature* of Pd. Humans experience a normal decline in dopamine with aging (Carlsson, 1976 and Hornykiewicz, Pifl et al.1 1988). Normal loss is approximately 13% per decade (Sweeney, 1991). When there is a loss of 80% of dopaminergic neurons, signs and symptoms of Pd appear (Riederer & Wuketich, 1976). There is no consensus about the cause of Pd. Scientists are examining the possibility of exposure to environmental toxins, natural and man-made as well as genetic susceptibility to environmental neurotoxins

Clinical Signs/Symptoms

There are four classic signs/symptoms of Parkinson's disease: tremor, rigidity, bradykinesia (i.e., slowness of movement), and flexion (i.e., bent posture) (Katz, Davidoff, Wolfe, 1988). Any one or all of these symptoms are exacerbated during times of stress or illness. Associated problems include dysarthria, dysphagia, dementia, urinary problems, and constipation.

Medical Management

Medical management of Parkinson's disease is generally pharmacologic. The goal of pharmacologic intervention is satisfactory quality of life rather than a return to normal function (Calne, 1993). The general rule of thumb is to postpone drug treatment until the patient complains of one or more of the following (Weiner, 1990):

1. Embarrassment because of tremors
2. Difficulty in performing ADL's
3. Interference with job performance

As a clinician, it's critical to understand the standard drug treatment protocol. Knowing which medications a patient has been prescribed, alerts the therapist to the stage of the disease and possible side effects being experienced by the patient. The most common side effects of Pd medications include: confusion, hallucinations, appearance of *new*, abnormal movements, and sudden unpredictable loss of mobility (especially after prolonged treatment with Sinemet).

Medical research is presently focusing on two surgical procedures for the treatment of Parkinson's disease; i.e., transplantation of fetal dopamine-producing cells to the adult brain and posteroventral pallidotomy (Sweeney, 1991; Laitinon, Bergenheim, Hariz, 1992). Further research and procedural refinement are necessary.

VOICE VERSUS TRADITIONAL "SPEECH" THERAPY

Efficacy

While pharmacotherapy has proven beneficial in the management of many motor symptoms of Pd, the speech and voice problems of these patients are not consistently or significantly reduced (Leanderson, Meyerson and Persson, 1971; Hansen et al., 1984; Larson, Ramig and Schere, 1988). Initial studies of fetal cell transplantation have not addressed speech or voice (Spencer et al., 1992; Freed et al., 1992; Widner et al., 1992). Fifty to 75% of patients with Pd experience some degree of dysarthria (Hamrock, 1991). The dysarthria experienced by patients with Pd results from rigidity or bradykinesia involving the respiratory, laryngeal, pharyngeal, buccal, oral and facial muscles (Ramig, 1990). The bowing of vocal folds observed on laryngoscopic examination of Pd patients may be caused by the rigidity of the arytenoid cartilages (Hansen, Gerratt, Ward, 1984). Patients with Pd may adduct their vocal folds posteriorly, but with reduced approximation medially (Ramig, 1990). The perceived effects are: (a) decreased loudness, (b) decreased maxi-

mum duration of phonation, (c) restricted fundamental frequency range, and (d) breathy/hoarse quality. Traditional speech therapy has not proven to be very effective (Ramig, 1990). Patients have been assailed with instructions such as, "slow down," "over enunciate," "take a deep breath," "sit up straight," etc. with limited benefits.

Ramig, Horri, and Bonitati (1991) reported on "The Efficacy of Voice Therapy for Patients with Parkinson's Disease" in the NCVS (National Center for Voice and Speech) Status and Progress Report-1. They evaluated an intensive speech therapy program which focused on vocal improvement. Therapy techniques were designed to improve perceptual characteristics of voice such as loudness, pitch and intelligibility by targeting the hypothesized underlying laryngeal/respiratory pathophysiology; i.e., bowed vocal folds, rigidity of cricothyroid muscle, hypokinesia, and vocal tremor. Statistically significant differences were found between pre and post-therapy measures of: (a) maximum duration of sustained vowel phonation, (b) maximum fundamental frequency range, (c) mean fundamental frequency and (d) fundamental frequency variation in reading.

Voice Symptomatology

The three classic voice symptoms of Parkinson's disease are: reduced intensity, restricted pitch variability and unsteady, breathy voice. Successful evaluation and treatment of Pd requires that the physiological bases of each of these features be understood. Perceptions of reduced intensity correspond to the physiology of bowed vocal folds, reduced inspiratory volumes, rigidity and hypokinesia in the laryngeal and/or respiratory muscles. Reduced pitch variability relates to rigidity and hypokinesia of the cricothyroid muscles. Perceptions of an unsteady, breathy voice is secondary to rigidity and hypokinesia or tremor in the laryngeal and/or respiratory muscles.

Assessment

Evaluation of voice in patients with Pd involves: (a) establishing base rate measurements for specific voice tasks, (b) assessing speech intelligibility, and (c) conducting videolaryngoscopy, when possible. Base rate measurements may include 1) maximum sustained vowel phonation time, maximum sound amplitude, and vital capacity; 2) pitch variability measures such as maximum range of fundamental frequency and variability of speaking fundamental frequency; and 3) measurements of breathiness, tremor and phonatory stability (i.e., jitter/shimner, number of pitch breaks) during sustained vowel phonation. During assessment, the key factors to note are:

1. Is the patient stimulable for a louder voice through isometric exercise; that is, ability to increase subglottic air pressure and tighten vocal fold adduction to increase loudness?
2. Is the patient's speech important to him/her and is he/she committed to change? (This is very important to note because the program to be described requires commitment.)

Treatment

The key feature for this treatment program is very simple: FOCUS ON VOLUME. It is not necessary to tell the patient to "speak slower," "over-enunciate," or "hold on to the last sounds." With traditional speech therapy, patients were overloaded with instructions. Rather, patients are told to "THINK SHOUT." By increasing vocal intensity, the patient is increasing subglottic pressure which causes an increase in the amplitude of vibration and prolongs the closed phase of the voice cycle. Through this simple technique, increased vocal fold adduction, decreased rigidity of the cricothyroid, and stability of vocal fold vibration is achieved. Improvement is typically experienced within the first session, thereby providing the patient immediate reinforcement.

In this intensive, short-term treatment program, the patient is seen individually or within a small group 3 to 4 times a week for 4 weeks following an initial evaluation. A typical treatment session may last 30 minutes. Group sessions tend to last 45 minutes to one hour. Group dynamics offer tremendous positive reinforcement, especially for those who live alone.

Therapy sessions may be comprised of the following components:

1. Recorded time of last medication - Always be cognizant of the effects of medication on the patient's performance.
2. Calibration of perceived loudness - The patient often needs to learn to monitor his own voice. Pd patients cannot always correlate effort with loudness. The patient needs to learn, "When I'm loud, I'm normal."
3. Warm-up activities-These activities include sustained phonation tasks and pitch scale exercises and are completed using the "THINK SHOUT" voice. Measurements for these tasks are made daily and are compared to the initial baserates to assess change.
4. Treatment tasks-The "new voice" is then used in a hierarchy of tasks: imitation, response to questions, oral reading and spontaneous speech. Each task is delineated into a standard articulation hierarchy; i.e., one-syllable word, polysyllabic word, phrase, sentence and conversation. Spontaneous speech activities should be initiated immediately in therapy. The spouse/significant other is more intensely involved during weeks 3 and 4. For each of the speaking activities, two objectives can be subjectively assessed:
    1. Did the patient THINK SHOUT?
    2. Was the utterance intelligible?
5. Homework - Homework is essential and given every treatment session. Materials used for voice, stuttering, aphasia, and articulation therapy, including materials for dysarthria are perfect. Make use of functional materials such as newspaper and magazine articles, recipes, etc.

Patients are re-evaluated at the end of the program and at six-weeks for follow-up. Coverage by Medicare has been forthcoming as long as progress is documented.

Carryover

Six to eight weeks after discharge, follow-up is recommended to determine IF and WHEN the patient is using his new voice. Patients often report an increased comfort level when using the telephone or ordering food in a restaurant. Patients can be encouraged to use phone mail as a carry-over activity. It's common to hear that the "new voice" is an available alternative and not used consistently throughout the day. The involvement of the spouse/significant other in treatment will greatly enhance the success for carryover.

While dysphagia management is not a

focus of this program, symptoms of swallowing difficulties may be observed or reported. If so, further evaluation (and treatment) may be necessary including a modified barium swallow. The most common cause of death in Parkinson's disease is aspiration pneumonia (Nedd, 1990).

CONCLUSION

The rehabilitation goal in Parkinson's disease is to maintain the patient at the best possible level of function. Treatment allows for maintenance of dignity, self-worth, and motivation. If patients with Parkinson's disease are denied treatment or simply not referred for treatment, they may be deprived of the best possible level of function.

Presently, most measures of effectiveness are NOT measures of function or quality of life. Therefore, the decision to fund and prescribe treatment are affected by historical biases and insufficient data to support the need for and benefits of therapy (Nedd, 1990). Documentation of underlying physiologic changes accompanying successful treatment is a critical element in defining treatment efficacy (Ramig, 1991). The objectives of this program directly correlate the physiological function to the perceived vocal behavior. Functional changes ARE being made which have a significant impact on the patient's communication skills and his daily activities.

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A Survey Of Educational Programs In Speech-Language Pathology: Counseling, Dysphagia And Traumatic Brain Injury

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ABSTRACT

One hundred fifty-nine out of 223 accredited and non-accredited programs offering degrees leading to professional careers in speech-language pathology responded to a survey regarding counseling, dyphagia and traumatic brain injury. Programs were questioned regarding demographic information, availability of coursework either intra- or interdepartmentally, coursework emphasis, and clinical practicum opportunities. Results varied within and between content areas.

INTRODUCTION

Preservation of the provision of a generalist education and specialty training in clinical practice are among many issues at the forefront of professional consideration (Aronson, 1987; Brodnitz, 1986; Campbell, Brennan, and Steckol, 1992; Culatta, 1992; Henri, 1994). University programs attempt to provide a sufficiently general, yet comprehensive preparatory education. This education provides the foundation for students in their evolution to and through the clinical fellowship year and beyond. A question asked frequently has to do with how well university programs prepare students for professional practice. This paper focuses on the results of a survey conducted in an attempt to respond to such a question. The focus of this paper is on the availability of coursework and/or clinical practicum opportunities offered to students for three content areas: counseling, dysphagia and traumatic brain injury.

Clinical speech-language pathologists employed in medical centers, rehabilitation centers or nursing home facilities have been confronted increasingly with patients who have difficulty swallowing. Another area increasingly requiring the expertise of speech-language pathologists has been traumatic brain injury and related sequelae. Review of employer position vacancy advertisements found in convention placement centers, the position vacancy section of **Asha**, mailings from national or local health care provision agencies and the local newspaper have been testament to the increasing recruitment of clinicians to evaluate and treat persons with dysphagia and/or communicative/cognitive problems as sequelae to traumatic brain injury. Managing persons with swallowing, communication or cognitive disorder/deficit requires some background in the principles and techniques of counseling. The speech-language pathologist is then prepared to interact more effectively with the patient and his/her family regarding the nature and effect of dysphagia or traumatic brain injury as it may pertain to nutrition and hydration, communication, cognition and/or daily living. The purpose of this study was to determine what academic coursework and clinical opportunities were being offered by university programs to speech-language pathology students for their education in the content areas of counseling, dysphagia, and traumatic brain injury.

METHODOLOGY

Selection- A Directory of university programs accredited by the Educational Standards Board (ESB) of the American Speech-Language-Hearing Association (ASHA) and non-accredited programs leading to a career in speech-language pathology was acquired from ASHA. Programs offering degrees in speech-language pathology and audiology, and speech-language pathology exclusively were sent a questionnaire (see Appendix A).

Procedure- The questionnaire (Appendix A) was designed to assess the amount and type of coursework offered by speech-language pathology programs for counseling, and both the coursework and clinical practicum experiences offered in the areas of dysphagia and traumatic brain injury. Additional questions probed demographic information such as the availability of coursework intra- or interdepartmentally and coursework emphasis. The questionnaire was formatted according to general rules of survey preparation as recommended by Babbie (1973). Recommendations specific to introductions, instructions, ordering of questions, spacing of questions, providing space for responses, and reproduction were incorporated.

Questionnaires were mailed to the directors/chairs of the 233 ESB-accredited and non-accredited speech-language pathology programs listed by ASHA. Data collection, coding and analysis were performed consistent with Shewan (1987).

RESULTS

Questionnaires were received from 159 programs for a return rate of 68%. Of the 159 programs responding, 106 (67%) were ESB-accredited. Responses from individual questionnaires for each content area were grouped and converted to whole number percentages for analysis. Responses by percentage compiled from all program responses for each item on the questionnaire for each content area are presented in Appendices B, C and D.

Counseling- Counseling coursework was required by thirty-seven percent of programs that responded (Appendix B). Sixty-three percent reported counseling coursework as an elective for speech-language pathology students. Sixty-one percent of programs reported offering a course within their own department. Of the sixty-one percent of programs offer-

ing a course intradepartmentally, fifty percent offered it at both the undergraduate and graduate levels. Forty-seven percent offered such coursework at the graduate level alone and three percent only at the undergraduate level.

An independent course in counseling was offered by forty-seven percent of the programs responding. Sixty-eight percent addressed counseling as part of another course or courses. Emphasis of the counseling course was reported to be children (7%), adults (5%), and both children and adults (88%); patient (4%), family (8%), and both the patient and family (88%).

Counseling coursework was offered to students through another department in seventy-nine percent of programs. Of the departments that offered counseling coursework to speech-language pathology students the department and percentage of time that department was listed was as follows: Psychology (30%), Special Education (17%), Rehabilitation (9%), Education (12%), Counseling (23%) and Other (9%). The category "Other" included a variety of departments. Included in the "Other" category were Counseling and Psychological Services, Social Work, Educational Psychology and Counseling, Home Economics, Rehabilitation Counseling, Educational Psychology, Individual and Family Studies, Genetics, Child and Family Studies, Clinical Counseling, and School Counseling.

Dysphagia- Dysphagia coursework was required by fifty-five percent of programs (Appendix C). Forty-five percent reported it as an elective. Seventy-three percent reported that a dysphagia course was offered to students within their department. Of these, ninety-seven percent addressed dysphagia as part of a course or courses. Fifty-nine percent offered an independent course. Course emphasis was on children (2%), adults (50%) and both children and adults (48%).

Clinical practicum opportunities in dysphagia were offered by twenty-eight percent of programs. Of those programs offering clinical practicum opportunities, the experiences included clinical evaluation (28%), modified barium swallow (22%), feeding techniques (24%) and swallowing therapy (26%).

Traumatic Brain Injury- Sixty-four percent of programs reported that coursework in traumatic brain injury was required (Appendix D). Ninety-two percent offered such coursework to students within their department. Of these, one percent offered coursework at the undergraduate level, eighty percent at the graduate level and nineteen percent at both the undergraduate and graduate levels.

In twenty-seven percent of programs, an independent course was offered in the department. In ninety-five percent of programs traumatic brain injury was addressed as part of another course or courses. The emphasis of the courses offered was children (<1%), adults (48%) and both children and adults (52%). Fifty-eight percent reported that clinical practicum experiences were routinely provided.

SUMMARY AND CONCLUSIONS

From the results of this study, it would appear that the classroom and clinical practicum offerings in counselling, dysphagia and/or traumatic brain injury among university programs are variable. Comprehensive coursework in the counseling area is not available for all speech-language pathology students. For the programs responding, greater than half or sixty-one percent of the undergraduate and graduate speech-language pathology student body do have coursework in counseling available; thirty-nine percent do not. Most (63%) of these courses are elective. Counseling coursework is offered as part of another course sixty-eight percent of the time.

Nine of the programs responding added a written note on the Counseling section of the questionnaire. Five programs stated that counseling coursework was elective, strongly encouraged and ninety percent of their students subsequently took such coursework. Two programs reported planning counseling coursework. Another commented that that program would like to offer a course if "time permitted." One last respondent noted that counseling theory and practice is "a great weakness in this and other programs."

These results are not inconsistent with those reported in the unpublished doctoral dissertation of Blosser and cited by Henri (1994). Blosser investigated graduate student preparedness for working in several types of clinical settings. Supervisory personnel rated graduate students from observation of the conduct of assessment and treatment procedures. Graduate student preparedness to counsel families and clients regarding disordered communication was rated as "poor" or "fair" across settings. If counseling coursework is limited or is not always available, then it is not surprising that clinicians' performance in professional practice might be rated as "poor" or "fair".

Although most programs (73%) offered dysphagia coursework, only twenty-eight percent of the programs had clinical practicum experiences available. A little more than half (55%) of the programs that responded required dysphagia coursework.

This paucity of required coursework and clinical practicum opportunities may be reflected in the results reported by Henri (1994). Fifty-four directors and/or clinical supervisors based in community speech and hearing centers throughout the United States responded to a survey. They were asked to rate speech-language pathology graduates' preparedness to treat each of twelve disorder areas. Ratings of "preparedness" to treat dysphagia were usually "poor" or "fair." Of twelve disorder areas rated, dysphagia ranked eleventh, suggesting speech-language pathology graduates were less well prepared to treat dysphagia than other disorder areas.

A large number of programs (92%) offered academic coursework in the content area of traumatic brain injury. Only somewhat more than half (58%), however, offered clinical practica.

There is little dispute that, "graduate level education is a very complex issue" (Henri, 1994, p. 45). Certainly one would be hard pressed to contest such a statement. What the solution might be is, of course, an equally complex component of that complex issue. Recommendations for improvement of graduate student preparation submitted by Henri (1994) have included specialized education and competency enhancement among others. Specialized education would prepare the student for medical/health care or educational settings. An alternative specialized education distinction might be between pediatric or adult communication disorders with a student program emphasis in one or the other. Competency enhancement would involve the development of proactive strategies to increase competencies necessary to most effectively treat communication disordered individuals. The content area(s) might be somewhat selective such as neurogenic communi-

cation disorders in adults. A more comprehensive professional education (classroom amd clinic) has been advocated by Spriestersbach (1989). Aronson (1987) has advocated the need for a clinical doctorate, a professional degree rooted in comprehensive classroom and clinical education.

Despite the complexity of the issue of graduate education and the preparation of professional practitioners, all professional practitioners should be aware of preferred practice patterns. Preferred practice patterns for speech-language pathology have been published (Asha, 1993). These preferred practice patterns constitute an official statement of the American Speech-Language-Hearing Association (ASHA) "to guide clinical practice within the profession" (1993, pp. vii - viii). Notable inclusions by procedure code and title are 04.0 Swallowing Screening, 07.0 Counseling, 30.4 Cognitive-Communication Assessment, 30.9 Swallowing Function Assessment, and 33.1 Swallowing Function Treatment among many others. It is incumbent upon education/training programs to offer students the coursework and clinical practicum experiences of one's profession in order to prepare the clinicians of tomorrow as best as is possible. Program development and the education of students in Speech-Language Pathology is by no means an easy or small task or accomplishment. Our professional advances and the expertise required to practice in the profession have progressed at an appreciable rate. Nonetheless, it can be stated that counseling, dysphagia and traumatic brain injury coursework and practicum experiences are areas that require further development in many speech-language pathology programs. The availability of such coursework and clinical practicum experiences will provide the necessary yet comprehensive generalist education to aspiring speech-language pathologists prior to initiating the more specialized clinical fellowship year, earning the Certificate of Clinical Competence and practicing professionally thereafter.

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APPENDIX A: SURVEY QUESTIONNAIRE

Please indicate your answer by writing in the blank space or by placing an X in the box by the appropriate answer(s).

PART 1 - DEMOGRAPHIC INFORMATION

1. Person completing questionnaire:

   Name _____

   Title _____

2. University/Institution name: _____

3. Department name: _____

4. Is your department:

   ( ) Part of a larger department
   ( ) Separate

5. With what college or school is your department associated? _____
   _____

6. What is the estimated size of your program?

   Undergraduate _____

   Graduate _____

   Doctoral _____

7. How long has your program been in existence? _____years.

PART II - COUNSELING

1. Is counseling coursework offered to students in your department?

( ) Yes
( ) No

If no, go to question #3.

If yes, at which level;

( ) Undergraduate
( ) Graduate
( ) Both

2. Is a course in counseling offered:

As an independent course in the department?

( ) Yes
( ) No

As part of another course or courses?

( ) Yes
( ) No

If counseling coursework is offered as part of another course or courses, please list the course title(s).

_____

_____

3. If counseling coursework is not offered in your department, is it offered to your students through another department?

( ) Yes
( ) No

If yes, what is the department?

( ) Psychology
( ) Special Education
( ) Rehabilitation
( ) Education
( ) Counseling
( ) Other

4. Does the counseling course have an emphasis on:

Check one in each column:

A.		B.	
	( ) Children		( ) The patient
	( ) Adults		( ) The family
	( ) Both		( ) Both

5. If counseling coursework is offered, is it:

( ) Elective
( ) Required

If counseling coursework is offered in your department as a course or part of another course we would greatly appreciate receiving a copy of your syllabus and reading list for the course(s).

PART III - DYSPHAGIA

1. Is dysphagia coursework offered to students in your department?

( ) Yes
( ) No

If no, go to #5.

If yes, at which level?

( ) Undergraduate
( ) Graduate
( ) Both

2. Is dysphagia coursework offered:

As an independent course in the department?

( ) Yes
( ) No

As part of another course or courses?

( ) Yes
( ) No

If dysphagia coursework is offered as part of another course or courses, please list the course title(s).

_____

_____

3. Does the dysphagia course have an emphasis on:

( ) Children
( ) Adults
( ) Both

4. If dysphagia coursework is offered, is it:

( ) Elective
( ) Required

5. Are clinical practicum experiences in dysphagia evaluation and management provided routinely to your students?

( ) Yes
( ) No

If yes, does this include:

Check all that apply.

( ) Clinical evaluation
( ) Modified barium swallow
( ) Feeding techniques
( ) Swallowing therapy

If dysphagia coursework is offered in your department as a course or part of another course we would greatly appreciate receiving a copy of your syllabus and reading list.

PART IV - TRAUMATIC BRAIN INJURY

1. Is traumatic brain injury coursework offered to students in your department?

( ) Yes
( ) No

If no, go to #4.

If yes, at which level?

( ) Undergraduate
( ) Graduate
( ) Both

2. Is traumatic brain injury coursework offered:

As an independent course in the department?

( ) Yes
( ) No

As part of another course or courses?

( ) Yes
( ) No

If traumatic brain injury coursework is offered as part of another course or courses, please list the course title(s).

_____

_____

Does the traumatic brain injury course have an emphasis on:

( ) Children
( ) Adults
( ) Both

3. If traumatic brain injury coursework is offered, is it:

( ) Elective
( ) Required

Are clinical practicum experiences in the evaluation and management of traumatically brain injured persons provided routinely to your students?

( ) Yes
( ) No

If traumatic brain injury coursework is offered in your department as a course or part of another course we would greatly appreciate receiving a copy of your syllabus and reading list for the course.

APPENDIX B: SURVEY QUESTIONNAIRE

COUNSELING

	YES	NO
Is counseling coursework offered to students in your department?	61%	39%
If yes, at which level?		
Undergraduate	3%	
Graduate	47%	
Both	50%	
Is a course in counseling offered as an independent course?	47%	53%
As part of another course or courses?	68%	32%
If counseling coursework is not offered in your department, is it offered to your students through another department?	79%	21%
If yes, what is that department?		
Psychology	30%	
Special Education	17%	
Rehabilitation	9%	
Education	12%	
Counseling	23%	
Other	9%	
Does the counseling course have an emphasis on		
Children	7%	
Adults	5%	
Both	88%	
The Patient	4%	
The Family	8%	
Both	88%	
If counseling coursework is offered, is it		
Elective	63%	
Required	37%	

APPENDIX C: SURVEY QUESTIONNAIRE

DYSPHAGIA

	YES	NO
Is dysphagia coursework offered to students in your department?	73%	27%
If yes, at which level?		
Undergraduate	0%	
Graduate	87%	
Both	13%	
Is a course in dysphagia offered as an independent course?	59%	41%
As part of another course or courses?	97%	3%
Does the dysphagia course have an emphasis on		
Children	2%	
Adults	50%	
Both	48%	
If dysphagia coursework is offered, it		
Elective	45%	
Required	55%	
Are clinical practicum experiences in dysphagia evaluation and management provided routinely to your students?	28%	72%
If yes, does this include		
Clinical Evaluation	28%	
Modified Barium Swallow	22%	
Feeding Techniques	24%	
Swallowing Therapy	26%	

APPENDIX D: SURVEY QUESTIONNAIRE

TRAUMATIC BRAIN INJURY

	YES	NO
Is traumatic brain injury coursework offered to students in your department?	92%	8%
If yes, at which level?		
Undergraduate	1%	
Graduate	80%	
Both	19%	
Is traumatic brain injury coursework offered as an independent course?	27%	73%
As part of another course or courses?	95%	5%
Does the traumatic brain injury course have an emphasis on		
Children	7%	
Adults	48%	
Both	52%	
If traumatic brain injury coursework is offered, is it		
Elective	36%	
Required	64%	
Are clinical practicum experiences in the evaluation of traumatically brain injured persons provided routinely to your students?	58%	42%

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